University News

DAY, JULY 6, 1987

Rs. 1.50

Silver Jubilee Convocation

man E. Borlaug, Emeritus Scientist, International Maize and Wheat Improvement Centre, Mexico, delivering the Convocation Address at the Punjab Agricultural University, Ludhiana

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UNIVERSITY NEWS

VOL. XXV JULY 6
No. 27 1987
Price Rs. 1.50

A Weekly Chronicle of Higher Education published by the Association of Indian Universities

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Editor:
SUTINDER SINGH

Bringing Universities and the Villages Closer

Devendra Kumar*

Though more than 3/4th of our population lives in the villages and the basis of progress of culture, civilization and economics depends to a large extent on the rural scene, the education system, more so at the university level, does not make the students know and feel oneness with the toiling rural masses. The new generation needs to be exposed to the rural economy and its problems to be able to bridge the widening gap between the urban and rural economics. It is evident that the nation cannot progress only on one foot i.e. urban, it has to move with both its feet the rural and urban which move forward in unison. Hence the need for rural orientation to our university system.

Existing Rural Programmes

Presently there are certain extra curricular progammes in the universities assisted by the UGC wherein the students do get a chance to go to the villages, e.g. (a) NSS, (b) Adult Education, (c) Population Education, etc. It would be an optimistic estimate that 10 per cent of the total student population gets involved in one or other of the programmes. The rest of the 90 per cent are left out Even this 10 per cent who are involved in these programmes have only a very superficial contact with the villages, since the programmes themselves need to be given further focus on the life of the poor in the villages Obviously the first step towards greater university-village association will be through improving and widening these existing programmes.

The second easy area where the university system within its present ambit does deal with the problems of the villages is Research Such projects, can be progressively increased in both humanities and physical science faculties which deal with the economy of the villages. It is very necessary that the identification of these problems is done carefully. In doing so, the academic community could develop closer association with voluntary institutions which are working in the villages and have been able to establish a rapport with poor of the land. The academics cannot know where the shoe pinches to those 'who wear no shoes'. This association of the university with the field agencies is necessary both from the point of view of finding out areas where researches are essential as well as for taking the results of the researches done to those whom it can benefit. For this it is necessary that mechanism is found out by which the researches undertaken in the university have direct relationship to the requirements of the society.

In the curriculum of the various faculties of the university also there should be areas of interface between what is taught in the class and what is required by the masses. Initially this area will be small but we have to see that all students are able to get a total picture of the countryside. Through their education a commitment should be created amongst the students by which they feel responsibility for weaker sections of the community. This, obviously, is difficult task and various disciplines will have to go deeper into the subject to find out where and how they can attach themselves. All the resources and time that is being utilised by the university system for higher education to the students, who are supposed to play major role in fashioning the future of the country, should be so designed that the learning process leads to development of the individual and at the same time makes them serve the society.

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There are today many programmes of imminent national importance such as afforestation, removal of environmental pollution, conservation of limited resources, preservation of endangered species of flora and fauna, replacement of non-renewable sources of energy by renewable sources of energy, education of population control, decreasing the percentage of people living below the line of poverty, etc, etc. These and many more aspects can afford themselves to be woven into the course contents of the syllabi and thus apart from extra curricular activities which connect the university to the villages and the research to the rural problems, there should be a curricular aspect of the course also which brings a student near to the masses. It would not be out of place to mention that the traditional higher education system leads to alienation of the educated from the masses, creates greater class distinctions and helps in increasing the phenomenon of elitism. These trends have got to be arrested if we want to work for a classless society of equals. Higher knowledge and distancing the classes from the masses are not a necessary nexus. This may seem a radical stance but the times demand that the country has the form of education which leads towards social justice along with improving the general quality of the life of the people on the whole.

Networking at State Level

In these circumstances, the universities of a State—as a family of institutions engaged in higher education in the state—should play a dynamic role in the fulfilment of the above tasks. For this purpose the following suggestions are offered for consideration.

(i) Documentation should be made of all such researches done in all the institutions under the universities of the State which have the potentiality of application in the rural field and which potentiality has not been achieved so far. This documentation could be both in the fields of science and technology as well as in social sciences.

(ii) From amongst the available technology, processes or methodologies from the academic field, a choice should be made of the most promising and essential. These be tried out in the field through extension programmes undertaken either by the universities themselves or in conjunction with the governmental/non-governmental agencies working in the field.

(iii) The various departments of the government, implementing various developmental programmes for the villages, come across problems of technical as well as of managerial nature which require solutions. There should be a method by which the universities being the Brain Trust of the State could act in helping to solve these problems and offer alternative systems and model which could be tried out by the government. The universities are to be made participants in the development strategy of the State especially the areas that touch the rural economy

(iv) There could be evolved State Level Coordinated Projects on the lines of A.I.C.P for the solution of some of the basic problems In these multi disciplinal projects more than one university could be asked to work after dividing the problems into various phases and farming out the same to different universities

(v) The State Government should come forwar with an innovative plan by which peopl engaged in rural studies and researches coul be exchanged from one university to anothe for schort periods of time so as to create new climate and culture for rural developmer through increased mutuality in the universi system.

(vi) Since the non-governmental agencies are in little better position to experiment upo innovative designs and management practic in the programmes of the government f taking benefits to the rural poor as well programmes of national development requiri people's participation, some of these prograi mes should be tried out under the aegis the universities. A method could be thoug out by which some of the government programmes which are in consonance with t projects and extension programmes in t particular university (and for which the u versity may be prepared to come forwa

(*Continued on page

THE SAGA OF GREEN REVOLUTION

Noble Peace Prize Winner, Dr. Norman E. Borlaug, Emeritus Scientist, International Maize and Wheat Improvement Centre, Mexico and popularly known the world over as the 'Father of Green Revolution,' participated in the Silver Jubilee Celebrations of the Punjab Agricultural University and addressed its Convocation. In his address Dr. Borlaug narrated the story of the genesis and growth of the Green Revolution. We are pleased to carry the full text of this highly perceptive address.

It is a very special privilege for me to participate in this Convocation—and Silver Jubilee—paying well deserved tribute to the Punjab Agricultural University and its staff and alumni on this happy occasion. It is appropriate on such an occasion that we pause and reflect on the many achievements of your great university from the time of inception up to the present before turning our attention to the challenges of the future.

The Punjab Agricultural University (PAU) has played a vital multifaced role in education, research and extension over the past quarter of a century. It has increased knowledge which in turn has resulted in the development of improved technology and through its application has increased the income and improved the standard of living of untold millions of people in this province, throughout India and in many other countries of the world

Although the Punjab Agricultural University has made many important contributions to other spheres of human progress, it appears to me, that its greatest contribution, without doubt, has been in the field of agriculture and food production. You have triggered a Green Revolution in food production and blazed a trial for other food deficit provinces and nations to follow. Consequently, I will largely confine my remarks to the contributions of Punjab Agricultural University and the farmers of the Punjab to the agricultural revolution—especially to the wheat and rice revolutions—which were spawned here in the mid-1960's and, subsequently, spread rapidly to other areas and became known worldwide as the Green Revolution. The Green Revolution displayed; (1) despair with hope, (2) food shortages with over-flowing granaries, and (3) famine with food abundance. In the process, it disapproved the hypothesis and computer models of doom-sayers, such as the Erlichs the Paddocks and the Club of Rome, who predicted disastrous famines for India, Pakistan, Indonesia and China in the 1970's and/or 1980. Instead wheat production in the developing countries has increased by 150 per cent since the early 1960's. Rice production has also increased spectacularly As a result, many of the developing countries that were suffering from extreme shortages of cereals two decades ago are now confronted with "surplus" grain stocks. In a large part these are "apparent" "surpluses", rather than "real surpluses" because of poverty and lack of purchasing power among a large low income sector of the population. For some of these countries the most important short term aspect of the food problem is now more equitable distribution rather than continued emphasis on production. While most Asian and many Latin American countries have spectacularly increased food production during the past two decades, virtually all African countries have experienced progressively falling per capita production resulting from the interaction of stagnant agricultural production and explosive population growth This must be corrected by revolutionizing sorghum, millet and maize production during the next decade I personally believe the technology is available to permit this to achieve. What is needed are a few charismatic "scientific integrators across disciplines" to properly assemble the package of improved technology, test and demonstrate its value widely on farmers' fields and at the proper time "marry" it to an economic government policy that will stimulate and permit its adoption by many farmers. It will not happen automatically it must be made to happen—by the application of aggressive leadership at both the scientific and political levels.

The Quiet Revolution in Mexican Wheat Production and the Indirect Role in the Green Revolution

I made my first visit to India in 1960 Since 1963 I have had the stimulating experience of visiting your country once or twice each year to collaborate in a minor way with your wheat scientists in their struggle to revolutionize Indian wheat production I have had the gratifying experience of seeing the Green Revolution in Indian wheat and rice production burst forth into bountiful golden harvest—that far exceeded my fondest dreams.

In the early years of Indian wheat revolution (1965 and 1966) large quantities of seed of the dwarf Mexican varieties Sonora 64 and Lerma Rojo 64 were imported from Mexico and grown with outstanding success. The large importation was made only after four years of widespread testing on hundreds of Indian farms. It was not recklessly playing with the lives of millions of innocent peasant farmers as was claimed by a number of highly respected American and European scientists. They were convinced, the Mexican varieties were certain to be poorly adapted to Indian climatic and soil conditions and moreover were almost certain to be vulnerable to rust epidemics.

The results were spectacularly successful despite the dire predictions. But why and how did this happen. The answer becomes self-evident from a brief historical review of the way the Mexican wheat research programme was organised as is briefly summarized below:

The First Foreign Technical Agricultural Assistance Program

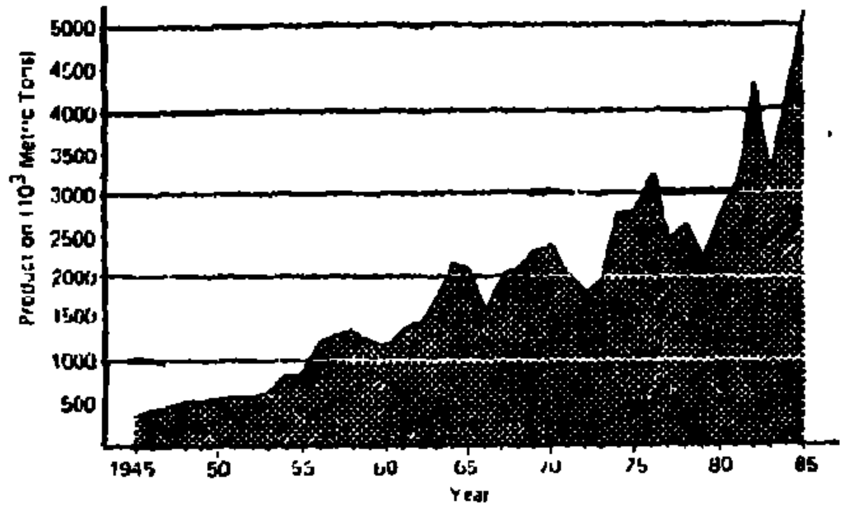
For the past 43 years, I have been privileged to participate in foreign technical assistance programs designed to help increase food production in more than 40 developing nations. This unique experience has involved working on food problems with : (1) governments covering the entire spectrum of political ideologies; (2) many different racial, cultural, ethnic and linguistic groups; and (3) a wide range of religious groups. I have found that my involvement in the struggle to produce bread for the hungry has been an acceptable and effective passport to understanding with all of these diverse groups. As a result of these experiences, I have seen some dramatic changes in yield and production of a few crops—especially wheat—in a number of countries. I take this opportunity to sketch how some of these changes were achieved and what factors had to be manipulated in order to increase yield and production.

The success story of the Cooperative Mexican Agricultural Program is now well known. This program was undertaken jointly by the Mexican Ministry of Agriculture and the Rockefeller Foundation in 1943, and represented the first cooperative attempt by a philanthropic organization and a foreign government to assist a developing nation to improve its agriculture.

The original directive in establishing the Cooperative Mexican Program was : (1) to develop a research program to produce technology capable of increasing the yield and production of basic food crops such as corn, wheat and beans (later other crops were added); (2) to develop a modest network of agricultural experiment stations on which to conduct the research, (although at the outset it was agreed that much of th research should be done on farmers' fields); (3) to tran a corps of young Mexican agricultural scientists in al of the disciplines that influence crop production--genetic and plant breeding, soil fertility and agronomy, irrigation, weed control, plant pathology and entomolog (agricultural economics and cereal technology were added later); (4) to formulate a package of improved agronomic production practices based upon the researc results, and transfer them to farmers' fields to increase production as soon as possible; and (5) to work "our solves" out of the job as soon as possible, by transferring the responsibilities for continuation of the program to the corps of trained young Mexican scientists as soon as sufficient numbers had been trained and acquired sufficient experience to effectively carry ou the program

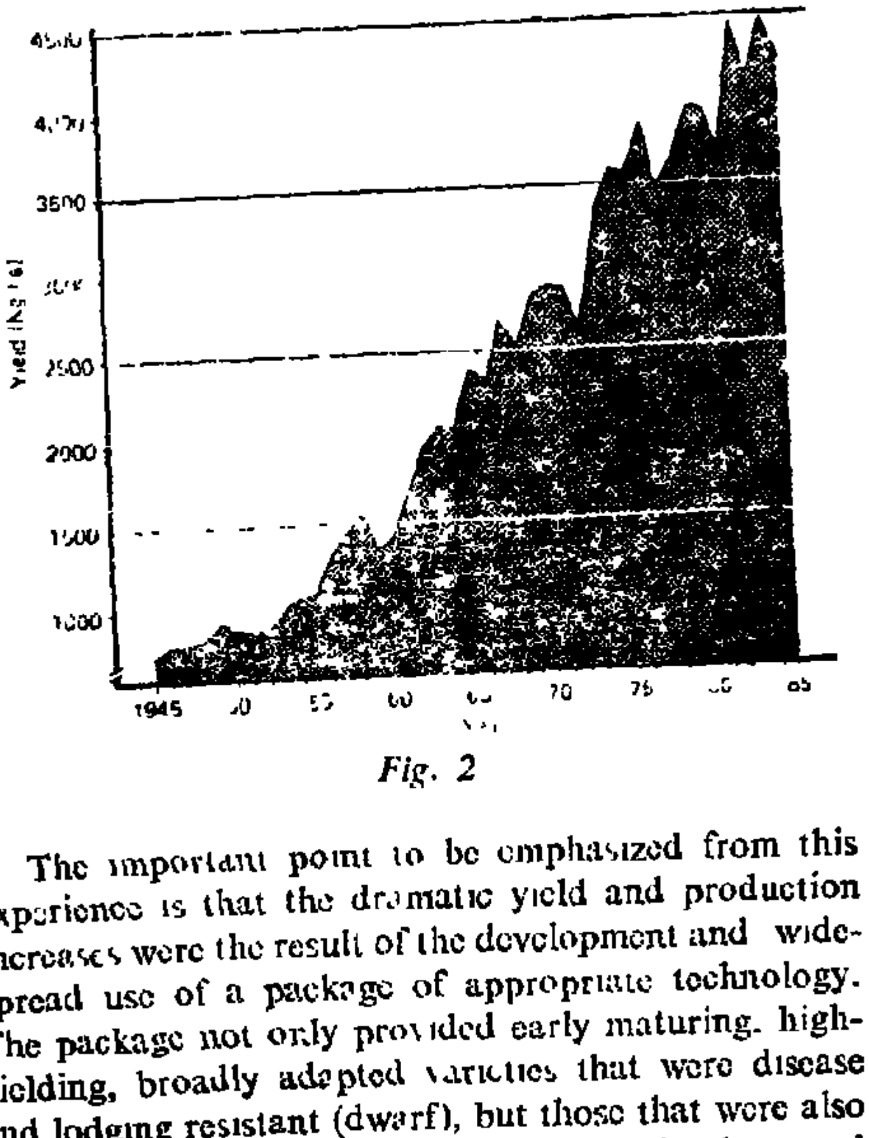
In the state of Sonora, in 1941—just three years before the Cooperative Agricultural Program was initiated---there had been three successive years in which most of the commercial wheat crop had been destroyed by stem rusts Wheat farmers who had suffered severe economic losses were disillusioned, disgruntled and openly hostile to agricultural scientists, because of the scientists' ineffectiveness in developing rust-resistant varieties. The psychological environment in which we began the breeding program, consequently, was very grim

Many challenges were met and overcome in the intervening years, but the ultimate success of the program is unquestioned In 1915, Mexican wheat yields were low and stagnant at 750 kilogram per hectare. Production was merely 365,000 metric tons, only 40 percent of consumption By the early 1950s, the impact of research and its application on yield and production was becoming evident. This resulted from the development of a package of improved technology and its rapid and widespread transfer to farmers' fields under the incentive of stimulatory economic government policy. By 1956, yields compared to the 1945 base period had increased 83 per cent to a level of 1370 kilograms per hectare, whereas production had risen from 365,000 to 1,250,000 tons and Mexico had achieved self-sufficiency in wheat production. Both wheat yields and production have continued to increase dramatically in Mexico. The 1985 national average yield reached 45000 kilograms per hectare, and production was 5,200,000 tons (Figures 1 and 2). Now, in favourable years the better farmers harvest 6.5 to 7.0 tons per hectare compared to 2.0 tons in 1945.



Impact of Improved Technology on Mexican Wheat Production

Fig. 1



Impact of Improved Technology on Mexican Wheat Yield

Fig. 2

The important point to be emphasized from this experience is that the dramatic yield and production increases were the result of the development and widespread use of a package of appropriate technology. The package not only provided early maturing, high-yielding, broadly adapted varieties that were disease and lodging resistant (dwarf), but those that were also more efficient in the utilization of both fertilizer and moisture, and that generally responded more favourably to better husbandry. Government economic policies were modified to provide incentives which encouraged rapid and enthusiastic adoption of the technology by farmers.

The unique, broad adaptation of the Mexican wheat varieties resulted from the, then, unorthodox *shuttle breeding* method that was employed in their development. It was a method derived out of necessity to rapidly develop rust-resistant varieties of wheat, yet was to have an unimaginably profound international impact many years later.

With the breeding program methods then in use everywhere in the world, only one segregating generation of breeding materials was grown each year. The breeding dogma of the era dictated that this was necessary in order to assure adaptation and success of a new variety, since there had to be a good fit between genotype and the environment; this implied that the segregating populations had to be grown and the individual plant selections made during the season and in the soil and climate where the variety was to be grown commercially. Consequently, only one generation could be grown and selected each year, which meant that it took a minimum of 10 years to select and evaluate rust-resistant varieties for yield, disease resistance, and milling and baking quality, and to begin to multiply their seed for release to farmers. Little or nothing was then known about the importance of photoperiodism in the adaptation of wheat and other cereal crop varieties.

Recognizing the frequency and destructiveness of recent stem rust epidemics to both farmers and wheat breeders, it was decided that it was essential to cut in half the number of years required to breed a new, improved variety. This theoretically was possible by locating two contrasting environments where temperatures were favourable for the development of wheat plants in different seasons of the year, so that two growing seasons could be used per year. This was achieved by first planting in early November on the coastal plain of Sonora (at an elevation of 39 metres and 29°N latitude), when the days were getting shorter Artificial epidemics of stem and leaf rust were generated, and the best plants with adequate rust resistance were selected in April, those with good plump seed were shuttled to Toluca Valley, about 700 miles to the south (at 19°N latitude and at an elevation of 2650 meters), where they were planted in early May when day length was increasing. At this elevation, temperatures are ideal for the development of the wheat plant during the summer season; moreover, frequent rains foster the development of heavy epidemics of strip, leaf rust and Septoria leaf blight. In October, the best disease-resistant plants were selected, and those with good plump grain were shuttled back to Sonora for planting in November. Employing this shuttle breeding method for handling segregating populations, the first stem rust resistant varieties were produced in four years and were growing in farmers' fields in the fifth year, rather than requiring 10 years with conventional orthodox methods of the era (Fig. 3)

SHUTTLE BREEDING : Produced the Widely Adapted Rust Resistant Semi-Dwarf Mexican Wheats that Catalyzed the Green Revolution

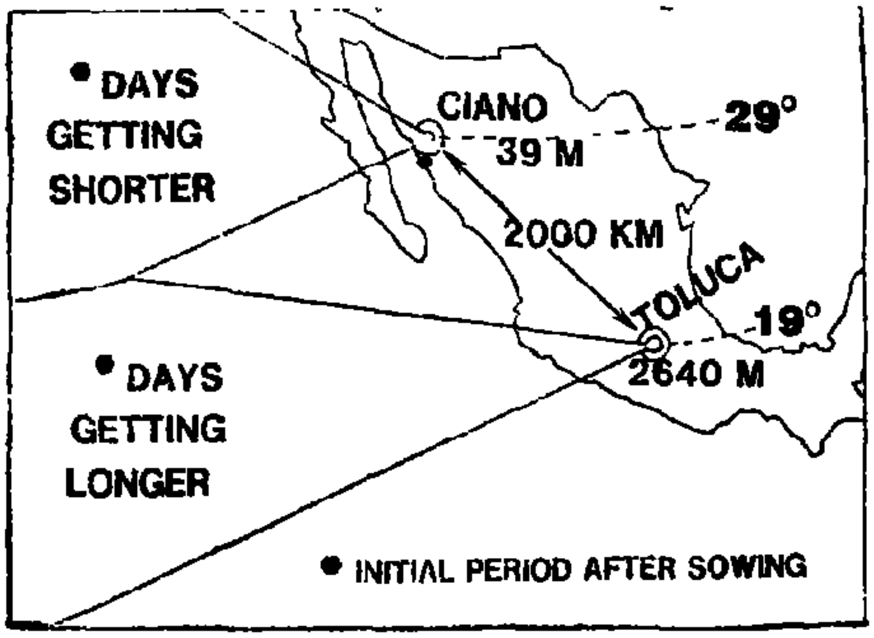


Fig 3

The broad adaptation of the new varieties simplified the seed multiplication and distribution problem in Mexico, a mountainous country where the crop is grown under a wide range of planting, dates, latitude, elevations and soil types. Many years later the importance of this unique breadth of adaptation permitted the Mexican varieties (after adequate testing) to be successfully grown commercially in many other spring wheat regions of Asia, Africa, Europe, South America, North America and Australia. Most important of all, the Co-operative Mexican Program developed and left in place a well-trained cadre of national scientists to continue the task.

By the late 1950s, it was evident that the food situation in Asia was becoming more and more critical. Anticipating a forthcoming crisis in the 1960s. Dr. J.G. Harrar, then Director (later President) of Agricultural Sciences of the Rockefeller Foundation, and Dr. F.F. Hill, Vice-President of the Ford Foundation, took the initiative to establish the first truely International Agricultural Research Institute. This institute, the International Rice Research Institute (IRRI), was established in collaboration with the Philippine government and began to function in 1962. The Mexican wheat research program was used as a model for establishing this institute. Today there are 13 such international institutes in the world, including the one in Mexico.

The Rockefeller Foundation Agricultural Program completes its Mission in Mexico.

By 1960, the Rockefeller Foundation had completed its mission in Mexico with the following results: (1) more than 700 scientists and technicians had been trained, (2) the research program was well organized and functioning smoothly, (3) the technology that was being generated by research was being transferred to farms, (4) Mexico was self-sufficient in cereal grain production; and (5) a graduate school had been established to provide advanced degree training in Agricultural Sciences. The Rockefeller Foundation's scientists had indeed "worked themselves out of their job."

To achive these objectives the Rockefeller Foundation had invested, during the 1943-1960 period, $ 6.1 million dollars ($23 million in 1985 dollars) in the Co-operative Mexican-Rockefeller Foundation Agricultural Program. Without doubt, the enormous benefits derived were far greater than anticipated when the program was initiated. Even more amazing were the immense unanticipated, indirect economies and social benefits that were derived during the 1965 to 1975 period as the seeds and technology of the Mexican wheat revolution spread to India, Pakistan Turkey and many other countries.

Impact of Improved Technology on Indian Wheat Production

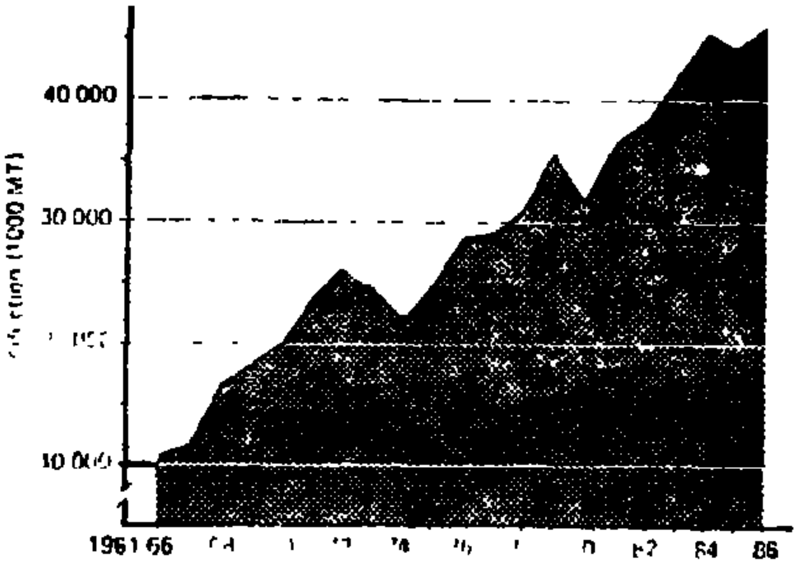


Fig 4

Impact of Improved Technology on Indian Wheat Gross National Product

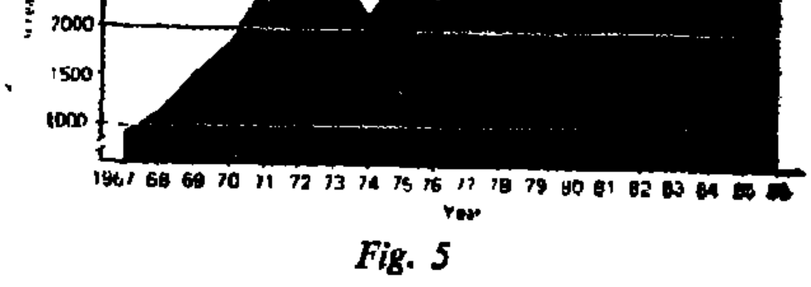


Fig. 5

The research program and the team of young Mexican scientists trained in the Cooperative Mexican Government-Rockefeller Foundation project were then transferred to Mexico's newly-formed National Institute of Agricultural Research (INIA). Most of the Rockefeller Foundation staff either had been transferred to other programs or had returned to their home country. Several, including myself, remained in Mexico temporarily to assist in the transfer of responsibility and to serve as consultants to the new organization. Visits made to several South American countries in the late 1950s confirmed that Mexican wheats were performing well under many conditions throughout Latin America.

During 1960, under the joint sponsorship of the Rockefeller Foundation and the Food and Agriculture Organization of the United Nations (FAO), I visited all the nations of North Africa, the Near East and the Middle East to observe wheat production problems and try to determine whether the Mexican wheat research experience and genetic materials might be of some value for increasing production in those countries. It became apparent that in many of the countries that I visited—with the possible exceptions of India and Egypt—there was an extreme shortage of trained scientists. Moreover, the few scientists that were available were generally ineffective because of poor research orientation and inadequate financial and organizational support. In India and Egypt, there were a considerable number of well-trained scientists, however, many were working on theoretical problems only remotely related to solving their country's wheat production problems. Nonetheless, almost everywhere I visited, and especially in India, Pakistan and Egypt, I thought I saw opportunities to effectively utilize the Mexican wheat varieties and research experience to increase production. At the end of the trip, I recommended that FAO and the Rockefeller Foundation jointly sponsor a scholarship program to train young North African and Near and Middle Eastern scientists in Mexico, under my supervision. As part of the proposal, I also suggested that we organize a cooperative Near and Middle East-Mexican Spring Wheat Yield Nursery to be grown in a number of locations in all of the Near and Middle East and North African countries, as well as in Mexico. The nursery was to include the principal commercial varieties from each country in the region, as well as the best commercial Mexican varieties and the most promising Mexican experimental lines. It was to be prepared in Mexico as a training exercise under my supervision. The proposal was accepted and the first group of trainees came to Mexico in the fall of 1960.

Little did I imagine then that the establishment of this interdiscipline (("hands-on" intern) training and nursery project would have a tremendous impact on wheat production in a number of Near and Middle East countries within the next seven years. In 1966, this nursery was expanded and became the International Spring Wheat Yield Nursery. For the last two decades it has been operated each year by cooperators in more than 75 locations around the world. It has provided a wealth of useful information on the adaptation of wheat varieties and new experimental lines to different soils and climates, and on their reactions to diseases and insect pests. It has also served as a vehicle for distributing new germplasm to cooperators everywhere. Most important of all, however, it has become an effective scientific bond of understanding and friendship that has linked more together wheat scientists around the world.

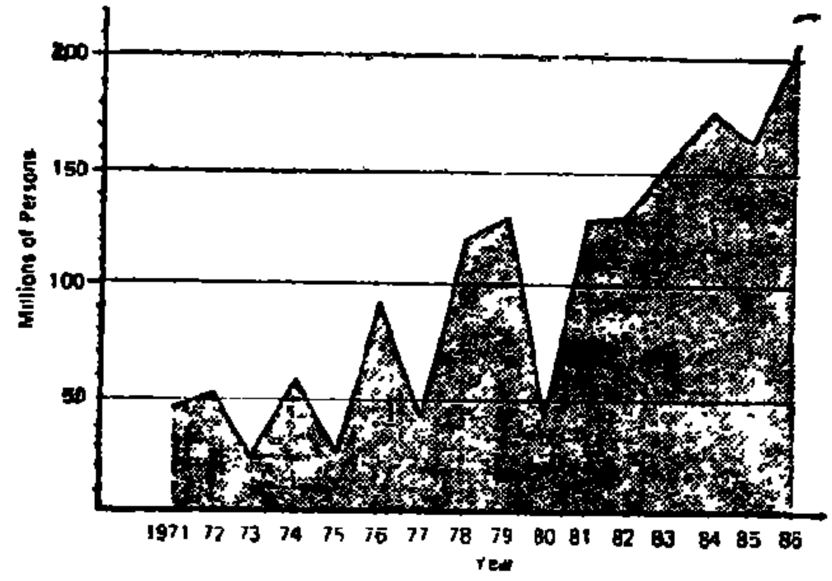

Additional Adults Provided with 65% of Daily Calories as a result of Increased Indian Rice Productivity

Fig 6

The first group of young trainees arrived in Mexico in 1961, in time to be infected by the euphoria of the high-yielding Mexican semi-dwarf wheats, which were then in the final stages of evaluation on farms. When they returned to their countries, they took with them many small samples of experimental lines of the dwarf Mexican wheats

Three years later, I was invited by the Government of India, whose scientists had not participated in the training or in the cooperative nursery program in Mexico, to visit their wheat research program. By then, the euphoria connected with the dwarf Mexican wheat varieties had spread to many countries. Dr. M S. Swaminathan, then a young Indian wheat scientist (now the Director of IRRI), had obtained seed of five of the early dwarf Mexican wheat lines through an international wheat disease nursery and was fascinated by their appearance He asked me during my visit, whether or not I thought they had any potential value for increasing Indian wheat production. I refused to make a judgement on the basis of the performance of those five inferior obsolete lines. I told him that I would withhold a decision until I had visited Pakistan and Egypt, en route back to Mexico, to see how the Mexican semi-dwarf wheats were performing there, since I knew that trainees from these two countries, who had been in Mexico, had taken back with them many advanced experimental lines.

En route to Mexico, I was invited by the Director of Research, senior wheat scientists and the Minister of Agriculture of Pakistan to review their wheat breeding nursery at Lyallpur (now Faisalabad). Trailing along in the background were the two young Pakistani scientists who had been in the training program in Mexico. I was disappointed to see the performance of the Mexican dwarf wheats in the demonstration plots. They were inferior to the Pakistani wheats under the conditions of the tests. However, I could see that the wheats had

TABLE 1. The Impact of Improved Technology on Indian Wheat Yield, Production and Land use before and after the Wheat Revolution.

Year (*Harvest*)	*Area Harvested* 1000 *Ha*	*Yield MT/Ha*	*Production* 1000 *MT*	*Gross value of increased production* (*Million $*) (**)/*Ha*	*Adults provided with carbohydrate needs by increased wheat* (*Millions of persons*) (***)*over* 1961-66 *period*	*Area required to produce crop at* 1961-66 *yield* 1000 *Ha*	*Area saved by yield increased over* 1961-66 *base* 1000 *Ha*
1	2	3	4	5	6	7	8
1961-66(*)	13,191	0.830	10,950	—	—	--	—
1967	12,838	0.887	11.393	88	3 2	13,726	888
1968	14,998	1.103	16,540	1.118	41 2	19,928	4.928
1969	15,958	1.169	18.652	1,540	56 3	22,472	6,613
1970	16,626	1.209	20,093	1,828	66 7	24,208	7,582
1971	18,241	1.307	23,833	2.576	94.1	28,714	10,472
1972	19,154	1.382	26,471	3,092	113.3	31,893	12.738
1973	19,461	1.271	24,735	2.758	100 7	29.801	10,339
1974	18,583	1.172	21,778	2,1166	79 1	26,238	7.655
1975	18,111	1 338	24.235	2,630	97.1	29,198	11.087
1976	20,458	1.310	28.846	2,381	130.7	34,754	14.295
1977	20,966	1.387	29,080	2.446	132 4	35.036	14 069
1978	20,946	1.480	31.000	3,493	146 5	37.349	16,402
1979	22,560	1.574	35,510	5,403	179.4	42.783	20,222
1980	21,962	1.437	31,560	4.923	150 6	38.024	16.061
1981	22,104	1.649	36,500	4.987	186 7	43,976	21,872
1982	22,308	1.696	37,833	4,358	196.4	45,582	23,274
1983	23,567	1.816	42,790	5.421	232.6	51,554	27,987
1984	24,700	1.842	45,500	5.911	252.4	54,390	29,995
1985	23,100	1.909	44,100	5,307	242.2	53,132	30,032
1986	23,100	2.030	46,900	5.209	262.6	56,506	33,406

*Average for the six-year period 1961-66.

**Gross value of increased production over 1961-66 base period; wheat value calcuated at US $200/ Metric ton similar to landed value of imported wheat in India from 1967-75 period, from 1976 to 1986 based on actual prices CFI India.

***Calculation based on providing 375 g wheat day or 65% of carbohydrate portion of a 2350 KCal/ day diet.

Source of Data : Ministry of Agriculture of India.

not been properly fertilized or irrigated, although the senior wheat scientists assured me that the methods that had been used in growing the demonstrations were optimum for Pakistan conditions. I stayed at the guest house on the research station that night and was scheduled to leave the next morning at ten o'clock. At daylight, I was awakened by the two young wheat scientists, who said they had something to show me. We walked to a remote corner of the research stations and there I saw four superb plots of Mexican semi dwarf wheats, growing as beautifully as in their native home in the Yaqui Valley halfway around the world. When I asked why they had not used those same agronomic practices to grow the Mexican dwarfs in the main demonstration plots we had seen the day before, I was informed that they were prevented from doing so by the senior scientists. It was then I learnt that when one researches the grade of senior scientist in a government organization in a densely populated developing country, where jockeying for position is vicious, one prefers the condition of "status quo" (the known), a rather than risk "change" (the unknown). This ultra-conservative conduct is rationalized, and seemingly accepted by governments, even though yields and production are low and stagnant, per capita food production is falling and it should appear obvious that the battle on the food production front is being lost to the human population monster The visit to Egypt revealed the same state of affairs.

After returning to Mexico, I wrote a report to the Government of India informing them that the Mexican semi-dwarfs could indeed play an important role in increasing wheat production in both India and Pakistan Within a few weeks, many additional small experimental samples of Mexican wheats were sent to both Pakistan and India and the race was soon on between scientists in the two countries to find out whether Mexican wheat varieties could contribute to increasing food production in their respective countries. From the fall of 1963 upto the present the PAU teams of wheat and rice scientists, extension workers, university and State officials have assisted the Punjab farmers to light and spread the Green Revolution. In the early years, the team was led by Dr. D.S. Athwal, who began to multiply seed of Kalyan (later named Kalyansona) in the summer of 1964. Today the team of highly productive scientists is led by Dr. Khem Singh Gill. I congratulate you all for your many great contributions towards making the Green Revolution a sustainable and expanding reality.

I will briefly describe the happenings in the Indian program. The average production of wheat over the 1959 to 1966 period was 10.95 million metric tons. After three years of testing on hundreds of farms, the high-yielding dwarf Mexican wheats—together with improved agronomic practices which permit them to express their high genetic yield potential—were introduced into India on a commercial scale in the 1965-1966 and 1966-67 crop seasons, when more than 18,000 tons of seed were imported from Mexico. Since then, both yield and production have increased spectacularly. Indian wheat production reached a peak of 96.9 million metric tons in 1986 more than quadruple, the yearly production of the 1959 to 1966 period; yields increased more than 123 per cent in the same period. The increase in gross value of product from the crop in 1984, due to increased wheat production over the base period, was 5.9 million dollars, most of which found its way into the pockets of several million small farmers. The additional production in 1986 over that of the 1959 to 1966 base period was sufficient to provide 65 per cent of the calories for 262 million people. Had the 1959 to 1966 yield/hectare prevailed, it would have required 45.5 million hectares to have produced the 1984 harvest instead of the 24.4 million hectares that actually were involved; thus a saving of 29.4 million hectares of land for other uses was realized. Perhaps even more important, is that the increase in wheat production, combined with corresponding increase in rice production, (resulting from the introduction of high yielding IRRI rice varieties), made India in 1977 self-sufficient in cereal production for the first time. Moreover, during the wheat and rice harvest of 1978 and the wheat harvest of 1979, a grain reserve stock of 22 million metric tons was accumulated. The monsoon failed in the summer of 1979, resulting in what was reputed to have been the worst drought in 90 years. Despite the drought, which resulted in a drop in rice production of 12 million tons, India fed its people from the reserve grain stock and emerged with a reserve of about 7 million tons of grain storage when the wheat harvest of 1980 commenced. There was, however, no hunger-famine crisis such as occurred in 1965-1966—thanks to the Green Revolution.

The rice revolution in India followed closely on the heels as the wheat revolution. Its progress is clearly shown in Table 2 and Fig. 7, 8 and 9.

Since 1971, Indian rice production has increased from 36.4 million tons to 64.2 million tons. During the same period rice yields increased from 0.981 kg/ha to 1.570 kg/ha. The increase of the 1986 grains harvest over the 1970 (base) harvest—an additional 28.43 million tons—provided 65 per cent of the calories for 205 million adults.

Impact of Improved Technology on Indian Rice Production

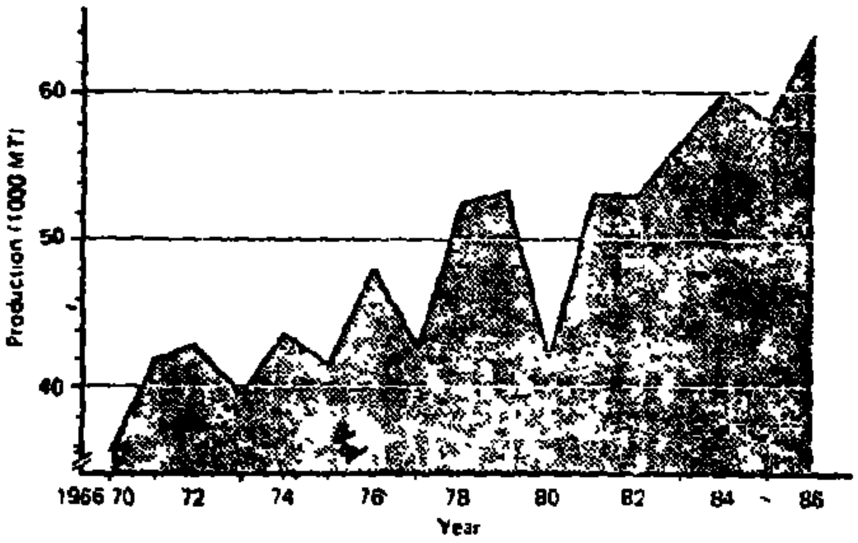


Fig. 7

Impact of Improved Technology on Indian Rice Yield

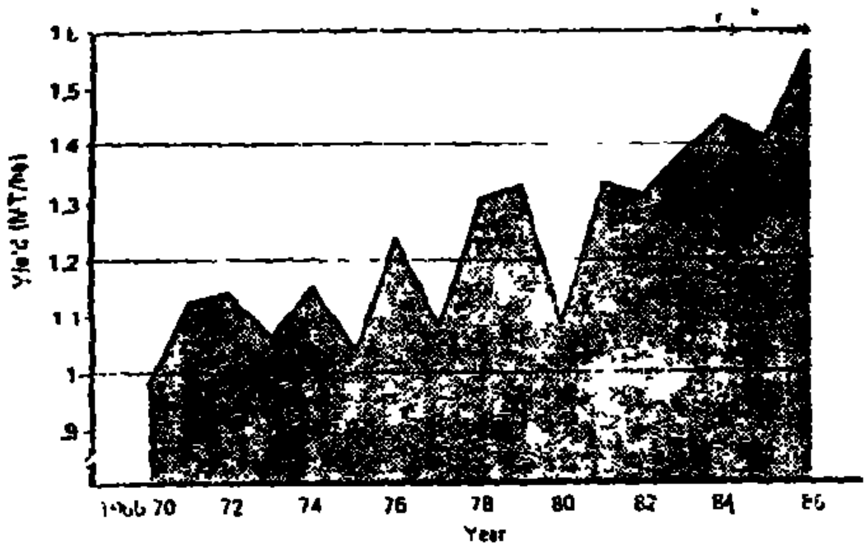


Fig. 8

Additional Adults Provided with 66% of Daily Calories as a Result of Increased Indian Wheat Production

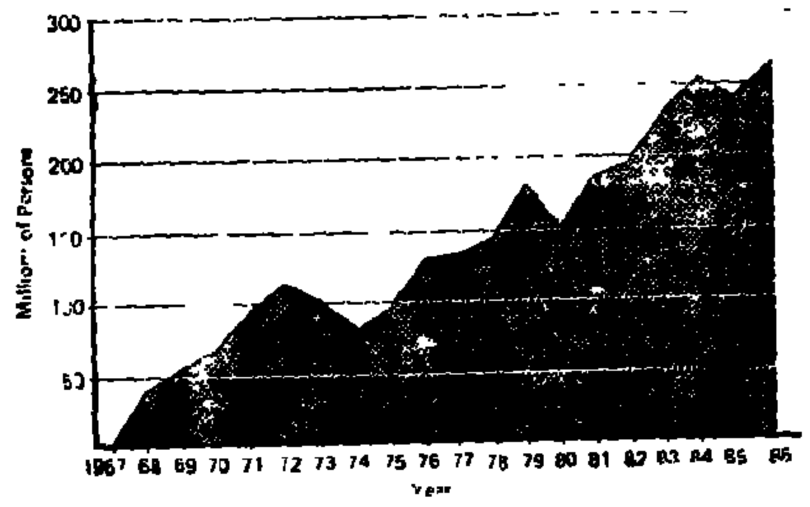


Fig. 9

The dramatic increase in production of wheat and rice in India over the past 20 years is the result of the interaction of the widespread use of high-yielding disease resistant dwarf varieties, the use of more fertilizer, improved cultural practices and wise government economic policies that stimulated production. The increased use of fertilizer to restore soil fertility (Fig. 10) combined with the use of high-yielding varieties were the two principal contributors to changes in yield and production. It is, however, impossible to de-aggregate the impact of fertilizer on wheat and rice production since fertilizer consumption data are only available for all crops. Moreover, lest we forget the changes in wheat and rice production technology combined with the use of more fertilizer have also ushered in widespread use of double and sometimes triple cropping on the same land, which has further contributed to food production.

Increase in Indian Fertilizer Consumption for All Crops

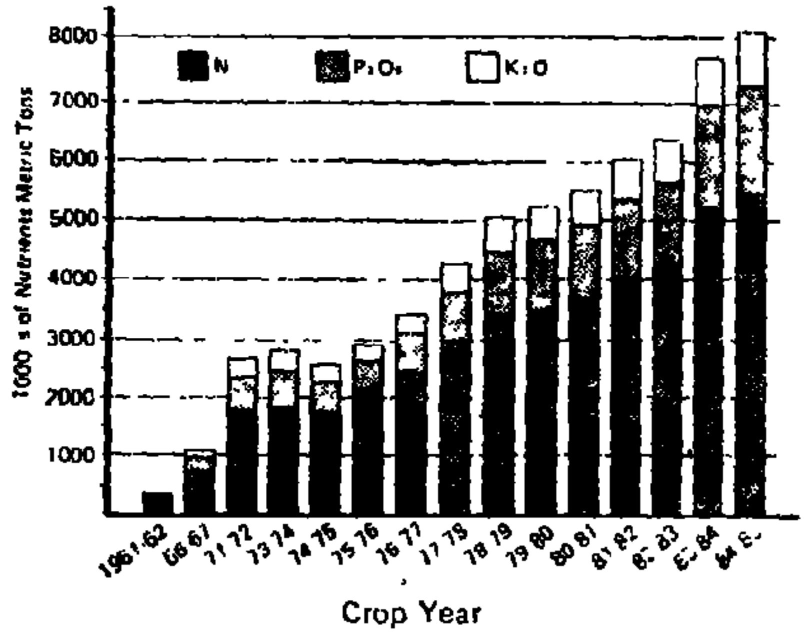


Fig. 10

Pakistan has also made spectacular progress in increasing wheat and rice yields, employing the dwarf Mexican wheats and dwarf IRRI rice varieties. Since 1966, wheat production has increased from about 4 million metric tons to 13.9 million metric tons in 1986—an increase of more than three-fold. Yields have more than doubled in the same period. In fact, until 1969, when political instability set in, it was making faster progress than India It became self-sufficient in wheat production for the first time in 1968, and then retrogressed to become a modest importer as progress in production slowed because of political instability, and pe capita production fell, because of rapid populatio growth. In recent years, its wheat research and production program is back on track, producing adequat wheat for domestic needs. Although its rice productio is only about one-fourth that of its wheat productio it has been a rice exporter for the last 12 years.

Turkey has more than doubled its wheat productio in the last 10 years and has again become a modest e porter. Bangladesh, although still a small producer of wheat, has made spectacular progress in increasing production in the last five years.

The People's Republic of China has made fantastic progress in increasing cereal production during the past decade. It has long been the number one nation in rice production and ranks second only to the United States in maize production. In 1984, China harvested 87.7 million tons of wheat and thereby displaced the Soviet Union, which harvested 76 million tons, as the number one wheat producer in the world. Most of the wheat grown in China is from winter varieties; however, the dwarf Mexican spring wheats have been used commercially in the south (along the eastern coast) where winters are less severe, and in the north-east provinces (especially in Kirin), where they are sown in spring.

The CIMMYT (Mexican) dwarf wheats and their derivatives, selected in national programs in more than 40 developing countries, are now grown on about 45 million hectares in the developing nations, including Guatemala, Columbia, Ecuador, Peru, Bolivia, Chile, Brazil, Morocco, Algeria, Tunisia, Egypt, Kenya, Zimbabwe, Zambia, Saudi Arabia, Jordan, Lebanon, Syria, Iraq, Iran, Afghanistan, Nepal and Bangladesh. They are also grown on large commercial areas in such developed nations as the United States, Canada, Australia, New Zealand, Spain, Portugal, Italy, South Africa, Israel and Argentina.

It seems incredible to me even today that an Iowa farm boy of very modest beginning could be privileged to participate even modestly and indirectly in wheat revolutions in many countries around the world.

Achieving a Green Revolution : Sorghum and Maize in Africa

Newspaper stories and television programs—depicting the hunger, starvation and human misery in African nations over the past three years—have resulted in the

TABLE 2. **Impact of Improved Technology on Indian Rice Yield, Production and Land Use Before and After the Green Revolution.**

Year (Harvest)	*Area harvested* 10000 *Ha*	*Yield harvested*	*Production* 1000 *MT* (*A*)	*Millions of adults provided with 65% carbohydrate needs by increased rice production*	*Area required to produce crop at* 1966-70 *yield level* 1000 *Ha*	*Area saved by yield increase over* 1969-70 1000 *Ha*
1966-70 (C)	36,360	0.981	35,770	—	—	—
1971	37,590	1.123	32,230	47.2	43,048	5,458
1972	37,760	1.141	43,070	53.3	43,904	6,144
1973	36,690	1.070	30,280	25.6	40,041	3,351
1974	38,290	1.151	44,050	60.4	44,903	6,613
1975	37,890	1.045	39,580	27.8	40,437	2,487
1976	39,470	1.235	48,740	94.7	49,683	10,213
1977	38,510	1.088	41,088	44.9	42,732	4,222
1978	40,280	1.308	52,670	123.3	53,690	13,410
1979	40,480	1.238	53,770	131.9	54,811	14,331
1980	38,970	1.082	42,180	46.8	42,997	4,027
1981	40,151	1.335	53,631	130.4	54,670	14,519
1982	40,705	1.314	53,593	130.1	54,631	13,926
1983	40,953	1.392	57,000	154.9	58,104	17,151
1984	41,200	1.459	60,100	177.6	61,264	20,064
1985	41,100	1.418	58,300	165.5	59,429	18,329
1986	40,900	1.570	64,200	207.5	65,443	24,543

A—Brown rice.

B—Calculations based on providing 65% carbohydrate portion of a diet of 2350 calories/day or 375 g of rice/day. Source of Data—Ministry of Agriculture of Government of India.

C—Average for five years.

initiation of an avalanche of assistance programs by many European, Canadian, Australian and American governments, as well as by international and private organizations. As a result, there are currently many hundreds of foreign agricultural technical assistance and development programs in operations in Africa, Asia and Latin America, designed to assist the developing nations to improve their agriculture, food production and standard of living. In Kenya alone, there were more than 1000 development projects operating in 1985. Many of them are "busy work" report writing projects that point out the social and economic ills of the country. Few of them have action programs to correct these ills. Unfortunately, learned academic reports do not necessarily equate to more food production Is there any wonder then that the Kenya government has difficulty in utilizing the many proposals? Does this multitude of projects add more confusion than enlightenment to Kenya's agricultural, social and economic problems? Most of these projects are relatively ineffective, despite the huge sums of moneys that are being poured into them. As I see it, there are four primary reasons why most foreign agricultural technical assistance programs are relatively ineffective, if not doomed to failure. These are:

(1) Program plans and budgeting commitments are of too short a duration.

(2) Lack of continuity in assigning expatriate scientists to foreign assistance programs.

(3) Inadequate coordination of research effort across scientific disciplines, and lack of research and extension program linkages with economists and political leaders, who establish economic policy.

(4) Inadequate provisions for advanced degree training for young scientists of the host country, so that they will be prepared to carry on the program effectively when the foreign assistance program is terminated.

Now, a brief statement about each of these factors which limit the effectiveness of the technical assistance programs.

In most developing nations, as is the case in most African nations at present, there is an extreme shortage of trained scientists. Moreover, either there are no research and extension organizations, or they are very weak and ineffective. Under such circumstances, there are no easy short-term fixes. Consequently, a "donor" country that is considering establishing a foreign technical agricultural assistance program in a developing nation must commit itself to supporting such a program for a minimum of ten years, and preferably fifteen, if it is to produce a lasting and positive impact.

To be effective, a foreign technical assistance program must be staffed with a small number of outstanding, well-trained, well-motivated, enthusiastic scientists who are capable of working effectively and tenaciously with the scientists of the host country. They must also be self-motivated to learn as much as possible of the history and culture of the host country and to develop at least a working knowledge of its principal language. By so doing, one establishes credibility and gains the confidence of the technicians, scientists and government leaders. Expatriate scientists must have good health and outstanding physical stamina, which will enable them to work effectively side-by-side with the young scientists of the host country under difficult "back-country" conditions. The expatriate scientists must be "hands-on" working scientists, not consultants, if the program is to be successful. And above all, they should have leadership ability and personalities capable, by example, of stimulating their young host country's scientific colleagues.

Continuity of scientific research personnel is essential if an effective program is to be developed. It takes at least three years of imaginative and dedicated experimentation for a scientist in each discipline (e g , plant breeding, agronomy and soils, weed disease and insect control) to establish an effective order of priorities to attack and ameliorate the major factors that impose bottlenecks on production It takes another three to five years to develop, through an aggressive on-farm research program, an appropriate and well-tested production package to extend to farmers. Unfortunately, because of donor government policies in many, if not most, foreign assistance programs, scientists remain in a given post for only two to three years before being moved to a similar post in another country, often with a different culture and language, with different soil and climatic conditions, and often to work on another crop.

In many foreign assistance programs, many of the scientists are professors who have been on detached assignment from a university in their home country, after which they return home, to be followed, in turn, by another professor on leave for a similar period. Such lack of continuity of scientific personnel is self-defeating. An effective, reliable package of improved production technology cannot be put together without continuity of capable, dedicated, research scientists in each of the scientific disciplines, working at both the experimental station and farm level. All too often, to make matters worse, much of the time of these expatriate scientists is spent in writing reports to satisfy bureaucrats of both the national and international breed or for self-advancement in their own organization. With all of these handicaps, is there any wonder why many technical assistance programs are ineffective? The most frequently missing component, required to make a foreign agricultural assistance program effective in increasing production, is the integrator.

I have found from experience that, no matter how excellent and spectacular the research is that is done in one scientific discipline, its application in isolation will have little or no positive effect on crop production Consequently, I have been forced to become an integrator across scientific disciplines, in order to assemble a reliable pakage of production technology capable of dramatically increasing yields, when it is properly applied

Let me be perfectly clear; we need many well-trained imaginative, scientific specialists in all disciplines that bear on agricultural production. In the developed nations it is not difficult to identify many outstanding scientists that have these qualifications But specialists alone will not suffice in developing nations, where most agricultural scientists do not have rural backgrounds, and where research and extension organizations are weak and in their infancy. In the developing nations we also need a few of those rare "green-fingered scientific integrators", call them "scrambling scientific quarterbacks" if you prefer who are comfortable, willing and capable of venturing across the grey areas between scientific disciplines to integrate the composite knowledge into a package of improved technological practices and see that it is applied to produce more food.

Since I was originally trained as a forester, permit me to use the analogy of a forest to emphasize my point. It is always more comfortable for most scientists to confine their research efforts to his/her own speciality—and thus stand comfortably in the thoroughly familiar and well-understood shade of the tree of one's own discipline—while ignoring the shade of the other trees. But the forest is made up of the shadows cast by many trees, of different sizes and often also of a considerable number of different species. Consequently, in order to best manage the forest for multiple-use purposes (e.g., lumber, pulp-wood and firewood production, watershed protection, erosion and food control, wildlife habitat and recreation on a sustained yield basis, a few scientists are needed who not only have outstanding credentials and skills in their own discipline, but at the same time can integrate across the shadows or scientific disciplines cast by all the trees of different sizes, ages and species in the forest. Only with such research integration can one develop and fit together the different pieces of the jigsaw puzzle of production, and by so doing, assemble a package of appropriate technology capable of increasing and sustaining the overall productivity of the forest systems to meet human needs.

So it is, also, with agriculture and food production. The "green-fingered" scientific integrator must assume the responsibility for overseeing the evaluation of the new package of technology on many farms, in order to establish that it has the potential to increase yields by at least 50 to 100 per cent, with acceptable levels of risk, over that of traditional methods. While this is being done, he must gain credibility and establish himself as a concerned, trustworthy collaborator with scientists, technicians and farmers of the host country. Finally, at the opportune time (which is difficult to determine, for in a large part it depends on intuitiveness developed by intimate contact with the program, culture and country), he must carefully and skillfully wander into the swampy, "no-man's land" of economic planners and political leaders who have the responsibility and power to control economic policies. They must be informed and convinced of the potential increase in yield and production that is possible if enlightened economic policies are embraced, which will stimulate widespread adoption of the new technology by farmers, and hence, result in large increases in food production.

I hope that there are several early mutants of "integrator scientist" present in this audience today. The developing nations need them badly now.

The spectacular increase in wheat production and rice production that has been achieved in many developing countries during the last two decades should bring hope to food deficit African nations. To convert the hope to reality will require drastic changes in government attitudes and policies. If the governments of the food-deficit African nations are to become serious about increasing food production, they must develop the political will to : (1) abandon the policies of cheap food for benefit of urban consumers (minority), a policy that has been maintained at the expense of the large, poor, subsistence food producing rural majority; (2) invest more capital in rural development, (3) provide greater investments in rural education; (4) provide greater support for the training of agricultural scientists; and (5) provide increased and more continuous economic support for dynamic programs in agricultural research, extension and production.

Currently there exists, in several African food-deficit nations, several improved varieties of sorghum and maize that are superior to local varieties. Moreover, there is considerable information on improved agronomic and plant protection practices, that when applied properly, will permit the improved varieties to manifest their clear superiority over the traditional varieties and practices. The improved varieties and agronomic practices for sorghum and maize have been developed jointly by national programs and ICRISAT and CIMMYT, respectively. At present, this research, for the most part, lies unused or under-utilised. What is needed now is the political and scientific courage and will to launch and support aggressive extension and production campaign programs in both sorghum and maize in areas where these improved varieties and agronomic practices are appropriate. A revolution in sorghum and maize production in a few areas, where the research materials indicate this is possible, must be made to happen. What is needed to make it happen now are several charismatic inter-disciplinary integrators that : (1) know intimately the idiosyncrasies of the sorghum and/or maize crops; (2) have leadership ability and can gain the confidence and support of the scientists of the host country; (3) have the skills to get effective economic policies established to support a dynamic production campaign; and (4) know how to maneuver to minimize the negative stiffling effects of the bureaucracies of both the national and international breeds. In other words, we need another scientist with the multiple skills of my long-time Canadian scientific associate and good friend, the late Dr. R. Glenn Anderson, who led the wheat revolution in India in the 1960s, or of another equally effective leader, like my long-time Mexican scientific associate and friend, Dr. Ignacio Narvaez, who led the wheat revolution in Pakistan during the same period. Success in revolutionizing production of a crop in one geographic area will catalyze enthusiasm and provoke changes in the other areas as soon as the research data justify such an undertaking

A look ahead at food problems for the next doubling of world population

I would be remiss if I did not express my concern about the monster that is human population growth.

As I look ahead at the magnitude and complexities of the world food needs for the next half-century, I am apprehensive. In 1975, when the world population rea-

From left to right : Shri S.S. Ray, Governor of Punjab and Chancellor of Punjab Agricultural Univers
Division, Winrock International Institute for Agriculture Development, USA, Dr. Dev Raj Bhumbla, fo
Head of the Department of Plant Breeding at the International Rice Resear

ched 4 billion, the world produced an all-time record harvest of 3.3 billion metric tons of all kinds of food (e.g., grains, pulses and grain legumes, tubers, oilseeds, sugar, vegetables, fruits, nuts, sugar, eggs, milk, cheese, meat and fish). If human population growth had continued at the 2 per cent levels of 1975, it would have doubled to 8 billion in about 40 years or by the year 2015 AD; consequently, food production must be doubled and more equitably distributed in the same period. There is evidence that worldwide population growth is beginning to slow somewhat, especially in the developed countries, but it continues to grow at a frightening rate in most of the developing countries. But even if we assume that this reduced rate will prevail and that the time to double to 8 billion will increase by 50, 60 or even 80 years to 2025, 2035 or 2055 AD respectively, the necessary food production increases are staggering.

Lest we forget, the world population growth rate expressed as annual percentage of natural increase is deceiving. Although the percentage of annual increase worldwide has fallen from 2.0 per cent to 1 7 per cent in the last five years, the annual increment in human numbers continues to increase frighteningly because of the larger population base. We need to remember that it took perhaps one to two million years for the human population to grow to one billion, which it reached in about 1850. It required only 80 years to reach a population of two billion (1930) and the three billion figure was reached in 1960 in only 30 years. The 4th billion was reached in 15 years; and the addition of the 5th billion was completed in 11 years, or by 1986.

Moreover, most of the increase in food production in the future must come from increases in yield from land already under cultivation, since in most of the densely populated countries there is little additional land suitable for agriculture that can be brought under cultivation without huge investments in irrigation, which are both extremely costly and slow to bring on stream.

I am cautiously hopeful that food production can be doubled within the next doubling of world population (40 to 60 years) provided that world governments have the political will and give high enough priority and continuing support to the agricultural sector in their development programs. It cannot be achieved with the miserly and discontinuous support that has been given to agriculture and forestry by governments over the past 50 years

g the degrees of Doctor of Science (Honoris Causa) on Dr. D. S Athwal, Director, Technical Cooperation ancellor of Haryana Agricultural University, Dr. Gurdev Singh Khush, Principal Plant Breeder and os Banos, Philippines and Dr. N.S. Randhawa, Director-General, ICAR, New Delhi.

To double food production will require a change in focus in development programs and an upgrading of the effort in agriculture and forestry, especially in the food-deficit developing nations, where crop yields are still low. We must train more and better agricultural scientists, expand our scientific knowledge, and improve and apply better technology if we are to make our finite land and water resources more productive.

We must educate the public to realize that producing more food and fibre and protecting the enviornment can, at best, be only a holding operation while the population monster is being tamed. In recent years, the "human rights" issue has generated must interest and debate around the world. It is a utopian issue and a noble goal to work toward. Nevertheless, in the real world, the attainment of human rights in the fullest sense cannot be achieved as long as hundreds of millions of poverty stricken people lack the basic necessities for life. The right to dissent does not mean much to a person with an empty stomach, a shirtless back, a roofless dwelling, the frustrations and fear of unemployment and poverty, the lack of education and opportunity, and the pain, misery and loneliness of sickness without medical care. It is my belief that all who are born into the world have the moral right to the basic ingredients for a decent, human life. However, to speak glibly and sanctimoniously about the mortality of the "right to life", while ignoring the mortality of the "quality of human life," only adds confusion to this fundamental complex issue.

Those of us who work on the food production front, I believe, have the moral obligation to warn the political, religious and educational leaders of the world of the magnitude and seriousness of the arable land, food and population problems that loom ahead. If we fail to do so in a forthright, unemotional manner, we will be negligent of our duty and inadvertently contribute to the pending chaos of incalculable millions of deaths by starvation. The imminence of the disaster is before us. It is closer than most people realize, or are prepared to admit. The problem will not vanish automatically; to continue to ignore it will make its solution ultimately more difficult.

A solution to this complex problem is imperative Why does mankind continue to inadvertently and irresponsibly try to see how many additional people can be "heaped" onto the planet earth ? Why do we continue to apparently always believe that future, newer and better technologies will expand the carrying capacity of our planet, while at the same time assure an improving standard of living for all ? It appears to me that we are behaving in a most irrational and irresponsible manner. Our behaviour implies that when we can no longer provide the good life for the ever-increasing number of people on the planet earth, we will always be able, at the appropriate time, to dispatch the excess numbers to colonize beautiful, hospitable virgin planets in other solar systems in outer space.

In remembrance of all those departed who contributed so much to the success of the Green Revolution

As I stand before you today my memory rushes back to a similar Convocation in 1969 here on the campus of the Punjab Agricultural University when I was honoured by being awarded an Honorary Doctor of Science Degree from your great university from the hands of the late Vice-Chancellor Dr. M.S. Randhawa. It also brings back fond memories of my great friends the late Dr. R. Glenn Anderson and Dr. V.S. Mathur who contributed so much towards the success of the Green Revolution here in India and also world wide.

In Conclusion

To those who are now completing their formal education let me add a last word of advice for whatever it may be worth. Don't believe all of the gloom and doom and gloom that has become one of the worst pollutants of the environment during the past two decades.

Despite all of today's gloom to doom, we live a longer and better life than all previous generations. Remember that constructive work is the best medicine God ever gave to man and that you can't win in any athletic game with negativism—much less so in the most important game of all, the game of life! Don't become complacent! I am convinced that Thomas Jefferson was thinking of this as he reflected on the decadence of past civilizations when he said: "Ease and security, were these the drugs that abated the eternal challenge in the minds of men ? And did nations, like men, grow sluggish and apathetic when they were well-fed and bodily comfortable?"

And finally, remember that education is a continuing process as Will Durant expressed so beautifully when he said: "In my youth, I stress freedom, and in my old age (79 years), I stress order. I have made the great discovery that freedom and liberty is a product of order. When I was 19, I knew everything and my father knew nothing. When I was 29, I was surprised how much my father had learned in the last 10 years. Now at 79, I know nothing ! So education is nothing more than a proressive discovery of our own ignorance."

So, keep studyng and learning. And God bless you all.

Good luck and good-bye. ☐

WHAT MAKES AN OLYMPIAN?

G.B.K. Hooja*

Condemned as a nation of "opium eaters" by European Imperialists, China has been transformed into an Asian giant within a span of 40 years. The secret lies in Mao-Ze dong's philosophy of education. He laid emphasis on three aspects of education—moral, intellectual and the physical. He realized that a good physical body was needed from the stand point of productivity, of military defence and of social well-being and accordingly proceeded to develop the physical education system in China in two parts.

In the first place, several sets of physical exercises were broadcast in sequence over the radio everyday, sometimes with musical accompaniment, for the public to participate in for about 5 minutes

In the schools, at recesses, between the classes, such exercises and music were broadcast over the microphone every day. Students and teachers knew how to exercise information in athletic grounds or in the corridors.

Same about offices and factories.

Because of their recreational value, these intervals became popular. Providing the workers with nutritious diet automatically followed, since collective action and socialistic discipline were seen as the concomitants of such physical education.

The other part of physical education was the Labour Defence Scheme The slogan was to train the body for the defence of the fatherland. The programmes included running (including charging), jumping (including jumping over barricades), throwing (including throwing grenades) and shooting The military tenor was deliberately kept high.

Talent was spotted out of the vast reservoir of manpower thus motivated. Those who had potential and were so motivated became national level athlete or adopted sports as a profession to become physical education teachers after due training. Not everyone was conscripted. In fact, those found physically fit and politically trustworthy were alone recruited. However, it was considered to be an honour to be drafted.

In GDR also, lessons in sports are compulsory at the school level. They form part of the integrated curricula. In fact, swimming has become part and parcel of education. 99% of school-leavers are swimmers

Similarly, factories and offices provide bases and facilities for mass sports. In this, the trade union too act as catalytic agents.

In USSR too, the main feature of the sports movement is its mass character. About 70m people out of 250m people go out for active sports. The country boasts of 3,300 large stadia. There are 66,000 gymnasia, 6,00,000 sports grounds, 1,500 swimming pools. Some 3,00,000 specialists including about 2,00,000 qualified trainers are employed in the task of spreading the cult of physical culture and sports throughout the length and breadth of the country.

Everyday, thousands of factory workers do "keep fit" exercises. The same are compulsory for school children of all ages before the beginning of lessons and in the morning radio broadcasts exercises for adults and children.

The main task of sports organization in USSR is to draw into the orbit of physical culture as many people as possible Till recently, special emphasis was laid on popularisation of sports in organized establishments, but now attention is shifting to the development of sports and physical culture in residential neighbourhoods. The plans of colony development are not approved unless they provide for sports facilities.

The Peoples' Games of USSR, known as *Spartakiads* are the biggest complex tournaments in the Soviet Union. They are in reality *mass festivals* of physical culture and sports. "Physical culture and sports have really become, in this country, the peoples' asset, an inseparable part of the culture of this Socialist Society, displaying new sports talents in all Union Republics of this multi-national country", says Sergei Pavlov, the Chairman of the USSR Sports Committee.

As for India, it may be too much to expect changes overnight, but we must traverse this path, sooner than later, for the health, honour and defence of our motherland. It is time we realized the importance of integrated physical activity in the scheme of holistic education. The aim must be to develop an all-round personality strong enough to face the challenges of

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life both as individuals and standard bearers of this great country.

Once such a big reservoir becomes available, it shall not be a difficult task to select top class performers in various fields, performers with high motivation, a strict sense of discipline and the requisite 'Killer' instinct.

It must not be forgotten that international sports have now become arenas of cut-throat competition. As Cohen (1973) says the essence of modern sports is "sublimation of aggressiveness... Sports Competition is nothing but the violence of the cultured man, a constrained turbulence. The player lets himself go within a legitimate code of conduct (of course)".

Here comes the importance of the role of the physical education teacher, who should not only be an expert in the matter of skill training, but also an engineer who understands the mechanism of the human behaviour on the playfield under extremely diverse situations and is able to make use of modern science and technology to guide the sportsmen to allay their tensions, anxieties and fears, so that they may discard all negative feelings and play "cool-headed", confident of victory and glory for self and the nation! ☐

Bringing Universities and Villages Closer

(*Continued from page 2*)

to participate in) could be entrusted to it. In such cases the government personnel and resources could be utilized directly through the university. Here the government officers and budget could be given to a university to work out particular agreed programmes in one or more blocks by trying out alternative methods on the basis of input of its academic and technological resources. These could help to find improvements possible to be incorporated in the present system. Such endeavours will also benefit the university by bringing it closer to the problems of the people and at the same time help the government in improving upon the existing mode and methods used for implementing national development programmes.

These suggestions however are only indicative and could be considered as illustrative and more of the same type could be added to the list. It is clear that the New Education Policy specifically requires the universities to take the above mentioned line of approach and so considerations of the various options available is imperative. ☐

ADMISSION TO M.PHIL (PHYSICS) COURSE 1987
at the

Centre For Development of Physics Education

University of Rajasthan
JAIPUR-302004

Applications are invited for admission to M. Phil (Physics) course 1987, being conducted by the Centre for Development of Physics Education. Candidates who have passed M Sc. (Physics) with at least 55 per cent marks are eligible for admission. College teachers may also be admitted to the course. They may, however, have to arrange their teacher fellowships through their own institutional channel.

The course consists of three theory papers plus dissertation/project work and practicals, and is ordinarily completed in one academic session. Application on the form available from the University accompanied by attested true copies of marksheets, certificate, etc. of examinations, must reach the office of the undersigned latest by **July 21, 1987.**

S. Lokanathan
DIRECTOR

Institution of Information Technology

The Institution of Information Technology (INFOTEK), a professional association of information scientists has been formed to promote scientific dissemination activities on a *non-profit basis* which shall include, inter alia, the following:

(1) To promote activities of Research in Information Processing especially in Information storage and Retrieval systems.

(2) To popularise computer handling of information.

(3) To develop information handling tools such as indexes, subject lists, thesaurus, classaurus, etc.

(4) To render advisory service relating to information storage and retrieval, setting up of scientific and technical libraries/information centres.

(5) To develop manpower and expertise in information processing and handling with special emphasis on Computer application

(6) To organise conferences, Get togethers, Seminars and Workshops to discuss professional matters relating to modern developments in the field of Information Systems/Services.

(7) To encourage integration of interfacing technologies such as Computer Technology, Logic and Statistical Application, Reprography, Micrographics and Telecommunication with Information Technology.

(8) Compilation of Reference Materials such as Directories, Handbooks, Manuals Bibliographies, Guide Books, etc.

(9) To publish a professional periodical to disseminate modern developments in the field of information technology.

Dr. V.A. Kamath (President of Micrographic Congress of India, New Delhi and Adviser, Nehru Centre, Bombay) has been appointed as the President and Dr. F J. Devadason (Head, National Information Centre for Leather and Allied Industries, CLRI, Madras) as the Vice-President of the Association. The other Office-bearers are Mr R. Vengan (Documentation Officer, CLRI, Madras), Secretary; Mr. R. Veeraraghavan (Scientist, MERADO, Madras), Joint Secretary and Mr. T. Krishnaswamy (Industrial Liaison Officer, CLRI, Madras), Treasurer. Mr. K. Ramamurthy, M.P is the Patron-in-chief of the association.

Gujarati Word Processor

Dr. N.S Randhawa, Director General of the Indian Council of Agricultural Research (ICAR) inaugurated the country's first word processor in a regional language at the Gujarat Agriculture University's computer centre. Dr. Randhawa said that this Gujarati word processor would be a great help to Indian scientists, whose number was more than that found in any other country of the world. He said that the Rs 600 crore spent on 29,000 scientists of the country was ill-utilised mainly because our scientists do not have modern and efficient support systems like computers to help them with their research analysis.

He said that in addition to research analysis, the word processing package of the Centre would be used to maintain students records, chalk out courses for undergraduate students of the university, for administrative work like maintaining records and mainly for providing agricultural economics data which is otherwise done by a large staff and is also very time consuming.

ONGC Plans Environment and Safety Centre

The Oil and Natural Gas Commission (ONGC) proposes to set up an environment and safety centre in Goa. This was revealed by the ONGC Chairman Colonel S P. Wahi while delivering the presidential address at the three-day national conference on "ocean technology for the 21st century" jointly organized by the Department of Science and Technogy, Department of Ocean Development and the National Institute of Oceanography at Dona Paula, near Panaji recently.

The main objective of the centre would be to train manpower for various environmental and safety programmes directly related to the ONGC's exploration operations.

The proposed centre is expected to cost about Rs. 4-5 crores and would be ready within the next three years.

Enhanced UGC Grants for Dibrugarh University

The University Grants Commission (UGC) is reported to have agreed to raise the seventh plan allocations for the Dibrugarh University from Rs one crore to Rs. 1.22 crore. However, it has also asked the university to augment its own resources for expansion and consolidation. The UGC has also agreed, it is further reported, to consider university's proposals for an Extension Service Centre, a Centre for North Eastern Studies and a Centre for Population and Demographic Studies in the Departments of English, Political Science and Economics respectively. The grant for these centres would be in addition to the plan allocation.

UGC Assistance for Botanical Research at Patna Varsity

The University Grants Commission (UGC) is reported to have identified the Botany Department of the Patna University for financial assistance of about Rs. one crore under its COSIST programme. The areas identified for research are cytogenetics and molecular genetics in respect of important forage and crop plants. This assistance will help the department to give a boost to its research work and improve the standard of teaching.

Summer Institute on Neuro-Pharmacology

Professor Allaudin Ahmed, Vice-Chancellor, Sher-e-Kashmir University of Agriculture and Technology, Srinagar, inaugurated a 20-day Summer Institute on Neuro-Pharmacology organised by the Haryana Agricultural University recently at Hisar. He said that the neuro-pharmacologists had a very important role in guiding and educating the society and that they should conduct their researches from the sociological point of view.

Prof. Ahmed, who himself is an eminent pharmacologist, said that environment did not mean only the forests and rivers but had much wider connotation. The toxic effects of insecticides and pesticides of macro and micro flora needed to be thoroughly discussed and solutions should be found on the long term effects of chemical compounds on our whole ecosystem so that ill effects on animals and humans should be obviated.

Over 24 scientists, researchers and teachers, both from the medical & veterinary institutions of the country participated in the three weeks' institute.

Research Projects

(1) Cochin University of Science and Technology

The Kerala State Committee on Science, Technology and Environment has recently sanctioned two research projects to the Cochin University of Science and Technology.

The project entitled: "Study of phase transitions using wideline NMR technique" will be conducted at the Department of Physics. Prof. C.P. Girijavallabhan is the Principal Investigator. The amount sanctioned is Rs. 50,000 for three years.

Another project entitled : "Studies on the effect of pesticides and other organic compounds on the water and biota to Cochin backwater" will be conducted at the School of Marine Sciences under the joint investigatorship of Dr. Jacob Chacko and Dr. M. Chandramohankumar. The amount sanctioned is Rs. 50,000 for two years.

(2) Anna University

- A Training Network is being established by the Government of India in collaboration with World Bank/UNDP (TAG) and bilateral agencies to train field staff and others to effectively plan, implement and maintain Water Supply and Sanitation Projects, with emphasis on the use of low cost appropriate technology needed to serve low income population of urban fringe and rural areas The Network will consist of participating institutions at regional level and key institutions at State level. The Ministry of Urban Development, Government of India, has identified the Anna University and the All India Institute of Hygiene and Public Health, Calcutta as two participating Institutions at Regional level in the Network.
- The Anna University, Madras, will shortly acquire an Interactive Image Processing Computer System for its Institute of Remote Sensing. The Government of Tamil Nadu have sanctioned the necessary funds for the purchase of the system.

IGNOU Launches Bachelor's Degree Programme

The Indira Gandhi National Open University has announced the launching of its Bachelor's Degree programme for such persons as do not have the requisite formal qualifications i.e. 10+2 or the Intermediate or equivalent qualification but shall have attained the age of 20 years on 1st January, 1988. The program will thus cater to the higher education needs of all those who desire to improve the qualifications, skills and competence. The candidates shall be required to take an entrance test to be conducted sometimes in September 1987. The test is intended to make an appraisal of the candidate's mental ability, general awareness, comprehension, etc. The medium of the test shall be English and Hindi. Last date for the receipt of application forms and fee of Rs. 25/- for the entrance test is **July 15, 1987**

The Bachelor's Degree Programme will be modular in nature—the modules being called courses On the successful completion of a course the students will get credits assigned to the course. A total of 96 credits shall be required to be earned to qualify for the award of the degree. Each credit would be equivalent to 30 study hours. Thus a student will be expected to put in 2,880 study hours over a period of 3 to 8 years to be eligible for the award of the degree. Each course of study under the degree programme would generally be of 4 to 8 credits. However, if a student takes up one or more courses just for enrichment purposes and is not keen to complete the degree programme, he/she will be awarded completion certificate for the course. Later on, if a student decides to work for the degree, the credits assigned earlier shall count towards the degree.

News from Agril. Varsities

National Agro-Forestry Research Centre

A national agro-forestry research centre will soon be opened in the U.P.'s Bundelkhand region. This was hinted at by the Union Minister for Agriculture and Co-operation, Mr. Gurdial Singh Dhillon, while inaugurating a seminar on Soyabean production and development at Jhansi.

He said that the setting up of this centre would help augment the integrated activities of agriculture and forestry in the country, particularly in the Bundelkhand region and subsequently the farmers of the region would prosper.

Mr. Dhillon said that the need of the hour in the field of Agriculture in the country was to increase production of oilseeds, so that it could be raised from 1 5 crore tonnes to 1 8 crore tonnes by the end of the Seventh Plan. He said that the Union Government had set up "Oilseed Technique Mission with a view to make the country self-sufficient in oilseed production at the earliest

Mr. Dhillon while appreciating the progress made under the oilseed production programmes, expressed his happiness over the state's second position after Madhya Pradesh, in Soyabean production in the country. He said that soyabean could be aptly called as 'two-in-one' crop because of its 40 per cent protein and 20 per cent oil. Mr. Dhillon assured that Centre would give all support to the soyabean production and development programme in Bundelkhand region.

The U.P. Agriculture Minister, Mr. Narendra Singh, said that arrangements had been made to cultivate soyabean in an area of one lakh hectares in Bundelkhand region this year. Under the programme, provision has been made to extend a subsidy of Rs. 200 per quintal for certified seeds and Rs. 100 per quintal for improved seeds to farmers. Demonstrations on a large scale will also be organised for which subsidy at the rate of Rs. 700 per hectare is admissible.

Dr. N.S Randhawa, Director General of the ICAR, also addressed the seminar which was attended by over 1000 farmers.

Cold-resistant Rice Varieties

The Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar, has evolved two cold-resistant and early maturing varieties of rice for cultivation in areas above 1675 metre altitude in the state. The new varieties K314 and K312 have been evolved by utilising genes from the local cultivars.

According to Dr. R.N Kaw, senior scientist and plant breeder of the University, about 500 different hybrid combinations were evolved during research work. More than 72,000 plant selections were evaluated for evolving improved rice varieties. He said that local cultivars possessed some cold resistant and fast breeding genes and these traits were continuously being incorporated in the rice breeding programme.

ICAR Regional Committee Meets at JNKVV

The Tenth Meeting of ICAR Regional Committee No. VII (an Inter-state Coordination Committee of ICAR and the States of Madhya Pradesh, Maharashtra, Goa, Daman and Diu) will be held at Jawaharlal Nehru Krishi Vishwavidyalaya, (JNKVV) Jabalpur on July 9-10, 1987. Jointly organised by the ICAR and the JNKVV, the meeting will be attended by the Ministers of State for Agriculture and Veterinary from the States of Madhya Pradesh, Maharashtra, Goa, Daman & Diu. The Director General of Indian Council of Agricultural Research (ICAR), Agriculture Secretaries of the States, Vice-Chancellors of Agricultural Universities and the Directors of Research. Veterinary and Extension of the region would be amongst the other participants

The committee will review the status of agricultural research and education in various states, while analysing/discussing in depth and making recommendations on the location-specific problems of agriculture, animal husbandry, fisheries and forestry particular to the region. Follow up actions taken by various centres on the recommendations made in its last meeting will also be discussed in detail.

Sports News

Indian Contingent for World University Games

Following participants and officials are leaving for Zagreb on July 5, 1987 to participate in the World University Games:

Tennis

Nandini Rangarajan (University of Bombay);

Nasreen Sujatali (University of Bombay);

Manoj Kumar (Bharathiar University);

Zubin Irani(University of Madrsa);

and M. Balachandran (Anna University).

N. Malikarjuna Rao (University of Madras) will be the coach of the team.

Athletics

Asha Aggarwal (University of Delhi); and

Charulata Naigaonkar (Nagpur University).

Ranjit Bhatia (University of Delhi) will be the leader of the contingent.

AIU News

AIU Honours University Contingents

Association of Indian Universities (AIU) hosted a reception on June 25, 1987 in honour of the University Contingents leaving for USSR and Yugoslavia to participate in the Festival of India and World University Games respectively. Shri D. Aroa, Director General, Festival of India, Shri P.K. Mishra, Director Youth Affairs, Department of Youth Affairs & Sports, Govt. of India and representatives from USSR and Yugoslav embassies graced the occasion.

Over 155 university participants have been selected by the Department of Youth Affairs & Sports for participation in the Festival of India in USSR commencing on July 3, 1987 at Moscow. They will leave in three batches to Moscow, Leningrad and Tashkent.

Following 48 participants left on June 30, 1987 to Moscow for the inaugural ceremony:

Bihu Folk Dance—Gauhati University : Somnath Borah (Ojha), Probin Sarma, Ajit Nath, Subodh Borah, Prasanta Duarah, Srimanta Madhab Bora, Tribeni Bora, Mrinalini Bora, Prosen Bora, Elorananda Rajbanshi, and Indira Barua (Official).

Karagam Folk Dance & Group Song—Bharathidasan University : P. Elangovan, S. Rahim, M. Ilangovan, S. Sekhar, R. Sundararaj, P. Guhanraj, N. Venkatraman, S. Jayasree, S. Saraswathy, Tarun Kumar Tripathy, Samuel Augurtine Thomas, E. Andrew Santhosh, Supratik Mukherji, and Aditya Pratap Mohanty. Accompanists : P. Natarajan, James Simon, V. Nirmala, and Officials H. Md. Salahudeen and Uma Maheshwari.

Ghummar Folk Dance—University of Rajasthan: Neelu Kulshrestha, Bhanu Mathur, Bhagesh Khangorot, Vijay Laxmi Arora, Kavita Saxena, Rajnandini Chhabra, Mukti Saxena, Manju Bhargava, Beena Kummawat, Seema Bhatt, and Yojna Sharma. Accompanists : Barkat Hussain, Meena Gusani, Mohammad and Ikramuddin, and P. Khanna (Official).

Seminar : Anirban Ghosh (Jadavpur University), Gayatri Vedantam (Bangalore University), and Jagdish Narain (AIU) —Official.

Sampson David, Cultural Officer, AIU will be the Group Leader.

UNIVERSITY GRANTS COMMISSION

FELLOWSHIPS AND VISITORSHIPS IN U.S.A.

U.G.C. INVITES NOMINATIONS

The University Grants Commission (UGC) has asked the Universities to nominate senior teachers in Universities and their affiliated colleges for some fellowships and visitorships and post-doctoral research work at the universities and other institutions in the United States.

Teachers with a minimum of 10 years' teaching experience and published research work are eligible for these fellowships and visitorships. The fellowship will be for a period of one academic year (6-10 months), while the visitorship will be for a short period (2-3 months) The U.G.C. will provide international air-fare from India to U.S.A and back. In addition, the U.S authorities will also provide allowance for maintenance, books and study-related travel in that country.

The fellowships/visitorships are for fundamental studies in frontier areas in Physics, Chemistry, Mathematics, Life Sciences, Earth Sciences and Bio-Technology, Laser Technology, Marine Resources Development, Computer Science and Technology, Semi-Conductor Technology, Micro-Processors applications and Micro-Electronics, Communication Technology, Educational Technology and Mass Media, Renewable Energy Studies, Environmental Sciences and Technology, Urban Development and Planning, Transport Studies and Social and Economic History (including Histriography), Science-Technology and Society, Comparative Literature, Literature and Society, Performing Arts, International Economic Co-operation, Money and Finance, Economics of Energy, Policy Sciences and Comparative Ethnography, Education, Planning and Management, Philosophy of Sciences, Social and Political Philosophy

Interested teachers may contact their own Universities. The universities have been asked to forward the nominations to the University Grants Commission latest by **31st July, 1987.**

davp 823(7)87.

AIU Library & Documentation Services

One of the important functions of the Association of Indian Universities is to act as a clearing house of information on higher education in the country. Towards this end the AIU Library is engaged in collection building and developing instruments for the dissemination of research information. Over the years a valuable collection of books and documents on different aspects of higher education has been acquired.

The Library has also developed Bibliography of Doctoral Dissertations as an effective tool in the dissemination of research information. Retrospective bibliographies covering the period 1857-1970 and 1970-75 were the first to appear. Effective 1975, however, the bibliography is issued annually in two volumes. One volume deals with Natural and Applied Sciences while the other records doctoral degrees awarded in Social Sciences and the Humanities. In addition to the normal bibliographical details like the name of the Research Scholar, the title of the thesis, years of registration for and award of the degree, and the name of the University accepting the thesis for award of a doctoral degree, the bibliography also gives name and complete address of the supervising teacher and an availability note that seeks to inform whether a copy of the dissertation is available for consultation and use in the University Library/Department or Registrar's Office.

The columns 'Theses of the Month' and 'Research in Progress' are intended to cut out the time lag between the receipt of information and its inclusion in bibliography. Such Universities as are not sending us regular information in respect of Doctoral Theses accepted and research scholars enrolled are welcome to make use of these columns.

The Library is open from 9.00 a.m. to 5.30 p.m. Monday through Friday.

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A List of Research Scholars Registered for Doctoral Degrees of Indian Universities

PHYSICAL SCIENCES

Physics

1. Ajithkumar, S *Studies on IR and Raman spectra of crystals* Kerala, Dr V Unnikrishnan Nair

2 Chamaria, Pramod Kumar. *Studies on oscillations in a discharge tube* HS Gour. Dr Gopal Singh.

3 Geetha, V *Surface oxidation studies of materials* Kerala Dr. V K. Vaidyan.

4. Joy, B H Selin *Comparative study of electromagnetic and electrostatic instabilities in the earth's magnetosphere* Kerala Dr. G. Renuka.

5 Mini, S. *Sun and interplanetary medium* Kerala. Dr. S R. Prabhakaran Nair.

6 Philip, Daisy *Vibrational spectroscopic and phase transition studies of crystals.* Kerala Dr G. Aruldhas.

7. Rajagopal, P. *Vibrational and phase transition studies of solids.* Kerala. Dr. G. Aruldhas.

8. Ramani, J.C. Jeeja. *Phase transition in solids and solitons.* Kerala. Dr. K.S. Viswanathan.

9. Veena Kumari. S. *Surface oxidation studies of materials* Kerala. Dr. V.K. Vaidyan.

Chemistry

1 Agnihotri, Keshav Rai *Studies in photochemistry of some imines, ketoimines and amides.* Panjab Prof S V. Kessar.

2 Arora, Kanh Singh *Transport properties of some copper (I) perchlorates in binary solvent mixtures at* 250C. Panjab. Dr D S Gill

3. Bains, Rajwant. *Synthesis and characterization of transition metal substituted hypervalent compounds* Panjab Dr B N Anand.

4 Baraskar, Uttam Kishanrao *Isolation and synthesis of natural products from medicinal plants* Shivaji Dr. R.B. Mane.

5 Beri, Ripla *Biological studies of some pyrimidine derivatives* Delhi Dr Ramesh Chandra.

6 Daniel, Thomas *Novel organic intermediates and reactionst.* Shivaji Dr N R. Ayyangar

7 Dogra Vijay Kumar *Synthetic studies in pheromones and insecticides.* Panjab Prof. O P. Vig and Dr. G.L. Kad.

8 Jayasankar, H. *Study on some lanthanide complexes with certain C and N donar ligands* Kerala.

9 Miglani, Ashu. *Chemistry of the bromosubstituted acetic acids as fused non-aqueous solvent systems* Panjab Dr. J K. Puri.

10 Sandhu, Arun *Chemistry of organoselenium and organotellurium compounds*. Panjab. Prof. R.D Verma and Dr. R.K. Bhasin

11. Sattar, Abdus. *Synthetic studies in terpenoids and related compounds* Panjab Prof O.P. Vig and Dr S.S. Beri.

12. Syngal, Meenakshi *Excess thermodynamic functions of solutions of n-butyl X ether and iso-propyl ether.* Panjab Dr. S C. Sharma.

13 Tambe, A S *Studies in chromatography.* Shivaji. Dr. N.R. Ayyangar.

Earth Sciences

1. Baghmarai, Narender Hari *Stratigraphy deformation patterns and metamorphic history of the Aravalli rocks in the Lunawada-Sanjeli Area District. Panchmahals, Gujarat State* HS Gour Dr P P Rhode

2. Baroniya, Rajesh Kumar *Geology and geohydrological studies in the Pench Valley, District Chhindwara, M P* HS Gour. Dr. D.P Rane.

3 Gupta, Hira Lal *Environmental impact of collieries (Mining activity) on surface and subsurface water along the Hasdo river.* HS Gour Prof. S K Babu.

4. Maheshwari, Gopal. *Deformation patterns and metamorphic history of the Aravalli rocks around Piplod, District Panchmahal, Gujarat State* HS Gour. Dr P.P Rhode

5. Pandey, Somesh Kumar *Structural and strain analysis of ductile shear zones developed in the basement granite near Hirapur District, Sagar, M P.* HS Gour Dr P P Rhode

6 Panchal, Ashok Kumar. *Deformation pattern along a segment of the Udaipur-Barwani lineament · South Western part of the Sarara Inlier, Southern Rajasthan.* HS Gour Dr P P Rhode.

7. Patel, Jainarain. *Hydrogeochemical investigations in Banzar Valley with special reference to base metal exploration* HS Gour Dr J P Srivastava

8. Sharma, Prabhakar *Mineralographic geochemical and geomicrobiological studies of low grade sulphide ores with special reference to ore dressing* HS Gour Dr J P Srivastava

9 Singhai, Praveen Kumar *Geology, geohydrological, pedological studies on the Bargi command Area M P covered by the left bank canal* HS Gour Dr. D P Khare.

10 Sudhakar, Chilukuri. *A comparative study of structures, surface and drainage of the geological formations of Madhya Pradesh State.* HS Gour Dr. S.N. Pandey

11. Tamrakar, Subodh *Lithology, sedimentation and depositional environment of the Lameta rocks of Sagar and adjoining areas.* HS Gour. Dr G N Saxena

12. Tiwari, Rajesh. *Chemical quality of water and heavy metals occurrence in the sediments of the surface drainage of surguja District, M P. in respect of environmental study.* HS Gour. Prof. S K. Babu.

Engineering & Technology

1. Jones, V. *Numerical characterization and computer simulation of heat transfer in ablative materials.* Kerala. Dr. K K. Shukla.

BIOLOGICAL SCIENCES

Microbiology

1. Pajni, Sangeeta. *Cloning and expression of yeast micro* alcohol dehydrogenase. Panjab. Dr. T K. Roy and Prof. J.K. Gupta

2. Satpathy, Gitarani. *Effect of malathion, an organophosphorus pesticide, on microbial population, biomass and metabolism in a tropical grassland soil.* Sambalpur. Dr. Niranjan Behera.

Biochemistry

1. Harjit Singh. *Studies on the molecular basis of protein absorption in sucking rat intestine.* Panjab Dr. Akhtar Mehmood.

2. Singh, Virender Mohan *Studies on glycosylation of intestinal epithelial tissue in rats: Effect of hormones and undernutrition.* Panjab. Dr. Akhtar Mehmood.

Botany

1. Golhani, Urmila. *Reproductive biological studies of forest tree seeds.* HS Gour Prof G P Mishra and Dr. Ram Prasad.

2. Guru, Rajesh *An ecological study of tree plantations of waste lands* HS Gour. Prof G.P Mishra

3 Jain, Kalyan Kumar. *Weed management in soybean, Glycine max (L) Merrill* HS Gour. Dr. T R Sahu

4 Mahajan, Amita *Biochemical studies on toria, Brassica compestris var, toria seed proteins-isolation Purification and physico-chemical characterization* Panjab. Dr. (Mrs) S Dua

5 Mathur, Moni. *An ecological study of the algal flora of the river Narmada at Hoshangabad* HS Gour Dr. A D Adoni and Dr (Smt) Nayantara Pathak.

6 Mishra, Sushma *Ecology of root nodules in grassland* HS Gour. Prof G P Mishra

7 Nema, Narayan Prasad *Growth analysis and photosyntheti efficiency of linseed, Linum usitatissimum L. cultivars* HS Gour Dr S P Bajpai and Dr D.K Tiwari.

8 Saxena, Gyanender Kumar *Intra specific competitio studies of opium poppy in two dates of sowing* HS Gour Prof K M Vyas and Dr K B Nigam.

9. Uniyal, Prem Lal. *Cytotaxonomic studies on the Gurhwa Himalayan mosses* Panjab Prof. S S Kumar

Zoology

1. Amruthakumari, L. *Studies on the macro-invertebrate associated with algae.* Kerala. Dr C.M. Aravindan.

2 Azfar Ahmed *Effect of acetone extracts of some plant and precocene-I on the reproduction and development of Dysdercu koenigii (F)* Panjab Dr. S K. Taneja.

3 Sahi, Jasminder *Studies in vitro and in vivo on the a tihepatotoxic activity of certain herbal drugs* Panjab. Dr. R.(Sobti and Prof. S.S. Handa.

4. Sahoo, Lilima. *Eco-toxicity of fluoride pollution on certai biological materials.* Sambalpur. Dr. B.N. Naik

Medical Science

1. Aghabozorgi, Hooshang *Synthesis of potent pseu pelletiering analogs and their pharmacological investigations.* Dell Prof. J.S. Qadry.

THESES OF THE MONTH

A List of Doctoral Theses Accepted by Indian Universities.

PHYSICAL SCIENCES

Mathematics

1. Abbas, S. Hassan. *Some problems in mathematical programming*. Bhopal.

2. Engelbert, Teresa. *On triple constructions of P-algebra valuation and complementation in semilattices* Andhra

3. Hajra, Rathindranath *Statistical theory of turbulence related to a derived vector field* Calcutta

4. Mahata, Nitai Pada. *Some theoretical problems on the study of elastic waves in layered media.* ISM.

5. Pal, Asimkumar. *Random insertions in trees and related topics.* Calcutta

6 Sharma, Anil *Momentum and heat transfer through laminar flows* Rajasthan.

7 Sharma, Ravi Dutt. *M H D heat transfer* Rajasthan

8 Subbarao, S. *Exceptional values of entire and meromographic functions* Bangalore.

Physics

1. Aminesh Kumar. *Atomic absorption spectrophotometric studies in environment* Nagpur

2 Bhakuni, D S *Study of fields associated with dyons.* Kumaun

3 Deuri, Rajlaxmi. *Phase transitions in a class of continuous spin systems, in low dimensions* NEHU

4. Hemchandra, K. *X-ray spectroscopic studies of some minerals.* ISM

5 Jayalakshmi, S *An investigation on the dielectrical and optical properties of certain plasma polymerised thin films and evaporated V_2O_6 films* CUST

6 Sat Narain *Some studies on the measurement and estimation of solar radiation.* Panjab

Chemistry

1 Bhakuni, R S. *Chemical investigation on Cornus, Melochian, Ajuga and Rubus species* Kumaun

2. Bose, Jyotirmoy *Studies on the catalytic control of major atmospheric pollutants* ISM.

3. Chakrabarti, Amitabha. *Studies on naturally occurring heterocyclic compounds.* Calcutta.

4. Dasgupta, Gopa *Kinetics of oxidation of some nitrogen and sulphur compounds.* NEHU.

5. Ganesan, P.K. *Studies on linear free energy relationships* Madurai.

6. Gaur, Buddhi Singh. *Synthesis and structural studies of novel drugs of substituted 1, 5 benzodiazepines and 1, 5-benzothiazepines* Rajasthan.

7. Ghosh, Harnath *Studies related to the failure of steels in fertilizer industry* ISM.

8 Goswami, G G *Synthesis and screening of some new heterocyclic fungicides* Kumaun

9 Mohril, Anil Govindrao *Compressibility and volumetric behaviour of aqueous non-electrolytes at low temperatures* Nagpur.

10. Munmun Kumar *On heterocyclic compounds* Calcutta.

11. Pant, P C *Metal ligand equilibria of some lanthanones in aqueous--ethanol medium.* Kumaun

12 Patel, Mahendrakumar Ramanlal. *Studies on starch granules.* Patel

INDIAN INSTITUTE OF SCIENCE

BANGALORE-560 012

REQUIRES

1 **SENIOR SCIENTIFIC OFFICER** under the COSIST Programme in the Department of Bio-chemistry. (IA/308-24/87)

Qualifications· **Essential**--Ph D in Chemical, Physical or Biological Sciences with experience in the application of modern precision instrumentation techniques in Biological Research

Desirable—Post-doctoral Research experience in developing physical methods of analysis, especially micro methods in areas such as spectroscopy, electrophoresis, chromatography, sedimentation, polarography etc

2 **SCIENTIFIC OFFICER** in the Department of Metallurgy (Reserved for Scheduled Caste) (IA/308-23/87)

Qualifications· **Essential**--Masters degree in Electronics Instrumentation

Desirable: 2 years experience in Electronics Instrumentation and in operation and maintenance of Microprocessor controlled instruments (e g SEM, XRD, INSTRON, DSC. Leco Analyser, Mossbauer, etc).

Experience is relaxable at the discretion of the competent authority

Emoluments: For Post 1 Rs. 2,965/- p m (approx) in the grade Rs. 1100-1600, and for Post 2· Rs 2,123/- p m. (approx) in the grade Rs 700-1300 Grades likely to have upward revision when IV Pay Commission recommendation becomes effective.

Details and prescribed application forms can be obtained on request (separate for each post) along with a self-addressed, Rs 5 40 stamped envelope of 28 cms x 18 cms size **before 16-7-1987** Requests for Post 1 should also accompany crossed I P O for Rs 5/- drawn in favour of Registrar, Indian Institute of Science (SC/ST candidates exempted if supported by Caste Certificate from a competent authority) Requests for Post 2 should accompany Caste Certificate from a competent authority

REGISTRAR

13. Rajur, Sharanappa, Basappa. *Studies in the Indole field: Indole and 3-methylindole derivatives of pharmacological interest.* Karnatak.

14. Sarala Devi, Ch. *Studies on ternary chelates of transition metal ions with picolinic acid N-oxides.* Osmania.

15. Sharma, Devender Kumar. *Determination of some organic compounds of pesticidal importance.* HP.

16 Shashi Lata. *Studies on coordination compounds of niobium (v) and tantalum (v) with some diazine derivatives.* Rajasthan.

17. Shrivastava, Swami Prasad. *Studies of the effect of surface active compounds on the reduction of xoygen at DME in aqueous media specially in cane juice in sugar industry* Bundelkhand.

18 Subbiah, P. *Studies on the electro-chemistry of organic compounds: Process development in the electroreduction of nitroso and nitro compounds and oxidation of sugars* Madurai

19. Sundram, Vasanthi. *Characterisation and utilisation of fly ash.* ISM.

20. Tinabaye, A *Studies on the chemistry of lichen and some plant constituents and some synthetic experiments* Madurai

21. Varshney, Madhu *A study of chemical constituents from medicinal plants of Bundelkhand region* Bundelkhand

22 Vijayan, K.K. *Synthetic studies in oxygen heterocyclics* Calicut.

Geology

1. Anbalagan, R *Geotechnical study and environmental appraisal of some water resource development projects in Kumaun Himalaya, U P.* Kumaun.

2 Bastani Allahabadi, Bahram H. *Miliolite rocks of Kutch, their geology and depositional significance* Baroda

3. Garhia, S S *Geology of Talla Champhi Debguru Area with special reference to petrological and geomorphological studies* Kumaun.

4. Majumdar, Subir. *Stratigraphy and structure of iron ore group rocks around Gua area, Singhbhum District, Bihar* ISM

5. Nagaria, Prabhat Kumar. *Tectonics and geotechnical investigations at Bansagarh Dam Project, Shahdol District, Madhya Pradesh* ISM

6. Reddy, C R *Geological studies on lead mineralisation at Bandala Mottu agiguladala mineralised belt, Andhra Pradesh, India* ISM.

7 Sen, Amit Kumar *Geology of the alkaline ultramafic carbonatite complex and associated mineralisation in the Sung Valley, Khasi and Jaintia Hills, Meghalaya* ISM

8. Sukumar, G Samuel *Stratigraphy sedimentation and associated mineral deposits near Guddapeh Town.* Osmania.

Engineering

1. Anjaiah, Bommanaveni. *Some new theoretical techniques of synthesis of digital and analog filters* Osmania.

2 Bose, Ashim Kumar *Studies on dewatering characteristics of flotation tailings from Barora washery* ISM

3 Chandrasekaran, S *Some studies on the effect of abrasive contaminants in lubricants on scuffing using a four ball machine* IIT, New Delhi

4. Panneerselvam, R *Algorithmic grouping of operation sequences as an aid to cellular manufacturing system.* Anna

5. Ramanujam, M. Kothanda *New approaches to solve linear programming problems* Anna.

6. Venugopal, R. *Studies on green pelletisation, characteristic of manganese and pyritiferous shales* ISM.

INDIAN INSTITUTE OF SCIENCE
BANGALORE-560 012
REQUIRES

1. **ASSISTANT PROFESSOR** in the Department of Civil Engineering (IA/308-25/87)

Essential : (a) Bachelor's Degree in Civil Engineering with a Ph D with specialisation in any of the areas . (i) Concrete Structures; (ii) Steel Structures, (iii) Solid Mechanics, (iv) Structural Dynamics; (v) Computer-aided design. (b) Minimum 3 years post-doctoral experience in research/research and teaching/research and design

Desirable : Experience in research guidance and developmental work. Publications in reputed journals.

2. **LECTURER** in the Department of **Mechanical Engineering.** (IA 308-27 87)

Essential : Ph D in Engineering with specialisation in Tribology

Desirable : 2 years experience in experimental research in Tribology.

3. **SCIENTIFIC OFFICER** in Instrumentation & Services Unit (IA 308-26/87)

Essential : M E/M Tech with one year experience in analytical instrumentation such as X-ray instrumentation OR M Sc with publication record comparable to the work required for Ph D degree and three years experience in the above areas

Desirable : Practical knowledge of design and operation of sophisticated crystallographic equipment such as single crystal diffractometers Experience in teaching/laboratory courses and computer programming

4. **SCIENTIFIC OFFICER** in the Department of **Mechanical Engineering** (IA/308-28/87)

Essential : Master's degree in Mechanical Engg specialising in turbomachine

Desirable : Minimum 2 years experience in measurement and analysis of turbomachine flows

Emoluments : Post 1 : Rs 3,075/- p m (approx) in the scale Rs 1200-1,900, Post 2 : Rs 2,123/- p m (approx) in the scale Rs 700-1600; Posts 3 & 4 Rs. 2,123/- p m. (approx.) in the scale Rs 700-1300 Grades likely to have upward revision when IV Pay Commission recommendations become effective.

Details and prescribed application forms can be obtained or request (separate for each post) accompanied by a crossed I P.O for Rs 5/- drawn in favour of the Registrar, Indian Institute o Science (free for SC/ST on production of Caste/Tribe certificat from a competent authority) along with a self-addressed, Rs 5 4 stamped envelope of 28 x 18 cms. size **on or before 22nd July '87.**

REGISTRAI

MADURAI KAMARAJ UNIVERSITY

MADURAI-625 021

ADMISSION TO M.Sc. COMPUTER SCIENCE (COMPUTER SOFTWARE) COURSE—1987-89

(Sponsored by the Defence Research & Development Organisation)

Advt. No. R/24/87 **Dated : 19-6-1987**

Applications are invited for admission to Master's degree course in Computer Science (Computer Software) (Two year full-time semester pattern) to be conducted in the Madurai Kamaraj University.

Eligibility

Candidates for admission to Master's degree course in Computer Science should have a Bachelors' degree with Major in Mathematics or Physics of this University or any other University recognised by the Syndicate as equivalent thereto. Candidates should have a First class with 65% of marks and above in Part III (major and ancillary)

Those who appeared for their final degree examination in April/May, 1987 may also apply.

Note: CANDIDATES WITH HIGHER QUALIFICATIONS SUCH AS M.Sc. ETC. ARE NOT ELIGIBLE.

Age Limit: Not more than 23 years as on 1st August, 1987.

Requisition for Application and Prospectus

Prospectus and Application forms can be had from the Registrar, Madurai Kamaraj University, Palkalainagar, Madurai-625 021 accompanied by a State Bank of India challan for Rs. 50/- remitted into Account No. 1 of Madurai Kamaraj University OR a Demand Draft for Rs. 50/- drawn in favour of The Registrar, Madurai Kamaraj University, payable at Madurai.

POSTAL ORDERS, MONEY ORDERS AND CHEQUES WILL NOT BE ACCEPTED.

An entrance test will be conducted on Saturday, the 1st August, 1987. There will also be an interview. The admission to the course will be based on the academic record in the B Sc., the results of the entrance test and the interview. The candidates will be called for interview based on performance in the entrance test and in the qualifying examination; and the University reserves itself the right to decide in this regard. The date and place of entrance test and personal interview will be intimated to the candidates by post. Candidates shall appear for entrance test and the interview at their own cost.

Financial Assistance: Selected candidates will be given a monthly financial assistance subject to an undertaking to serve the Defence Research & Development Organisation for a period of five years at the end of successful completion of this degree.

LAST DATE FOR ISSUE OF APPLICATION FORMS	:	**13-7-1987.**
LAST DATE FOR RECEIPT OF FILLED IN APPLICATIONS	:	**20-7-1987.**

Late applications will not be accepted. The University is not responsible for any delay or loss in postal transit.

The entrance test will be conducted at Madurai, Madras and Bangalore.

P. P. Chinnadurai
REGISTRAR

PANJAB UNIVERSITY
CHANDIGARH
(Advertisement No. 4/87)

Applications are invited for the following posts so as to reach the Registrar, Panjab University, Chandigarh, alongwith postal orders of Rs 10/- by **25-7-1987.** Fourteen days extra time is permissible to persons who have to submit their applications from abroad.

1. **Professors** : (Rs. 1500-60-1800-100-2000-125/2-2500)

Mathematics—2.

2. **Readers** (Rs 1200-50-1300-60-1900).

Mathematics—4.

3. **Lecturers** : (Rs. 700-40-1100-50-1600)

Mathematics—3

4 **Research Assistant** : (Rs. 550-20-650-25-750)

Mathematics—1.

5. **Research Associate**

Centre for Advanced Study in Mathematics—1.

Category A . Rs. 1400/- p m (fixed)
Category B : Rs. 1600/- p m (fixed)
Category C . Rs. 1800/- p m (fixed).
Category D · Rs 2000/- p m (fixed).

6. **Research Fellows** : (Rs. 800/950/1000/- p.m. fixed), with annual contingent grant of Rs 3,000/-)

Centre for Advanced Study in Mathematics—4

7. **Research Fellow** : (Rs 950/- p m. (fixed)

Mathematics—1. (Department of Mathematics).

Note: 1 The Vice-Chancellor could place before the Selection Committee names of suitable persons for its consideration alongwith the applications received in response to the advertisement

2 It is not obligatory on the part of the University to call for interview every candidate who possesses the essential qualifications.

3. The number of vacancies may change.

4 The University may also prepare panels of suitable people for appointment against vacancies occurring within a specified period.

Detailed instructions, specialisations, various allocations and reservations concerning the various posts and other details are available with the application forms. These can be obtained from the Cashier, Panjab University, Chandigarh personally on payment of Rs. 2/- or by making a written request to the Deputy Registrar (Estt.), Panjab University, Chandigarh, accompanied by self-addressed stamped (worth Rs. 3.40) envelope of 23 x 10 cms and postal order of Rs. 2/- drawn in favour of the Registrar, Panjab University, Chandigarh.

THE UNIVERSITY OF BURDWAN
RAJBATIB. URDWAN
WEST BENGAL
Advertisement No' 1/87-88
Dated : June 23, 1987

Applications in the prescribed form are invited for the following posts in the approved scale of pay (Deputy Controller of Examinations and Deputy Inspector of Colleges : Rs 1200-50-1300-60-1900/- and Assistant Librarian : Rs 700-40-1100-50-1600/-) The posts carry dearness and other allowances, and pensionary benefits according to the Statutes of the University

A. **Deputy Controller of Examinations** —One Post

B **Deputy Inspector of Colleges** —One Post

C **Assistant Librarian** —One post

Educational Qualifications and Experience for A & B

(a) **Essential**

(i) Uniformly good academic record with a B+Master's Degree or its equivalent

(ii) At least 10 years' experience in a position involving supervision, control and planning of Examinations, administration of Colleges or in an Institute of Higher Learning or Government or other academic bodies At least 5 years of the 10 years' experience should be in higher position of high level administration

(iii) Age not less than 35 years Relaxable in case of exceptionally qualified candidates.

(b) **Desireable**

(i) A Doctorate Degree or published paper of high standard **OR**

(ii) Experience of at least 10 years in a fairly senior position in any academic Institution like a College or a University or a research organisation

(iii) For Deputy Controller of Examinations it is essential to have experience of at least 3 years in conducting of examinations in either Under-graduate teaching Institution or equivalent

Educational Qualification and Experience for C:

(a) **Essential**

(i) Uniformly good academic record with a B+Master's Degree with a Bachelor's Degree in Library Science or a Master's Degree in Library Science.

(ii) Age not below 30 years Relaxable in the case of exceptionally qualified candidates.

(b) **Desirable**

At least 7 years' experience in a recognised Library preferably belonging to University or an Institute of Higher Learning

The choice of the Selection Committee may not necessarily be confined to those who apply formally.

In the absence of suitable candidates having the required administrative experience, the essential qualification pertaining to administrative experiences required for the posts may be relaxed or waived on the recommendations of the Selection Committee

For application form and other information, apply to the Registrar, University of Burdwan, Rajbati, Burdwan with a Self-addressed Stamped (Re 1/-) envelope (9" x 4")

Last date for submission of application with the requisite fee of Rs 5/- is **July 31, 1987**

P. Banerjee
REGISTRAR

CENTRAL INSTITUTE OF ENGLISH AND FOREIGN LANGUAGES
HYDERABAD - 500 007
Advertisement No. V/87

Applications on prescribed form ar invited for the post of **Co-ordinator, EMRC** in the Institute service in the scale of pay of Rs 1500-60-1800-100-2000-125/2-250 (pre-revised) so as to reach the undersigne on or before 31-7-1987

Qualifications

Essential

An eminent scholar with published work of high quality actively engaged in research About ten years' experience o teaching and/or research. Experience o guiding research at Doctoral level

OR

An outstanding scholar with establishe reputation who has made significant contribution to knowledge

Desirable

Preference will be given to a person wh has a formal qualification in Education Technology/Distance Education/Materia Production/Curriculum Developmen Journalism/Communication Studies etc and has the experience of producin Radio & T.V. Programmes.

Prescribed application form and furthe details can be had from the Registra Central Institute of English and Foreig Languages, Hyderabad-500 007 by sending a postal order for Rs 2/- (Ps. 0 50 fo SC/ST candidates) with a self-addresse envelope (10 x 20 cm.) duly stampe (Rs. 1.30 ps.)

K. Jayashank
REGISTRA

S.N.D.T. Women's University

1, Nathibai Thackersey Road, Bombay-400 020

Advertisement No. 3 **Dated: June 20, 1987**

Applications are invited in the prescribed forms available at the University Office between 10 30 a m. to 2 30 p.m from Monday to Friday and 10 30 a m to 12 00 noon on Saturday, on payment of Rs 5/- (M O /Indian Postal Order/in Cash) for the following posts, to be filled in at the University Departments and its conducted Institutions at Bombay and Poona, so as to reach the undersigned on or before **fifteen days** from the date of its advertisement.

Sr No of Post	Post and Name of the Dept /Institution	No of Post	Post under Reserved Category	Medium of Teaching
A	**P.G. Dept. of Communication Media for Children at SNDT College of Home Science, Poona.**			
1	Cameraman	ONE TEMP	—	—
2	Sound Recordist	ONE TEMP	—	—
3	Maintenance Engineer (Asstt Engineer)	ONE TEMP	—	—
4	Sr Technician	ONE TEMP	—	—
*5	Laboratory Assistant	TWO TEMP	ONE	—
B	**P.G Dept. of Home Science at SNDT College of Home Science, Poona.**			
1	Reader in Any Area of Home Science	One	—	— MAR/ENG
C	**SNDT College of Education for Women, Poona**			
1	Lecturer in Education (Science & Maths)	ONE	—	ENG/MAR
D	**SNDT Women's University Library, Extn. Library Juhu Campus, Bombay-49**			
1	Dy Librarian	ONE	—	—
E	**P.G. Dept. of Child Development at SVT College of Home Science, Bombay** (Under Lab of Child Development)			
1	Nursery School Teacher			ENG
F	**P.G. Dept. of Foods & Nutrition** (under DRS Programme) **at SVT College of Home Science, Bombay** up to June 30, 1988	ONE PART TIME TEMP		
1	Research Associate	ONE TEMP	—	ENG
G	**SVT College of Home Science** (Under Graduate Level) **Bombay**			
1	Lecturer in Foods & Nutrition	ONE	—	ENG
2.	Lecturer in Science (Physics & Chemistry)	ONE	—	ENG

Sr No. of Post	Post and Name of the Dept./Institution	No of Post	Post under Reserved Category	Medium of Teaching
H.	**P.G. Dept. of Gujarati, SNDT Women's University, Bombay**			
1.	Reader in Gujarati **Under Special Assistant DSA Scheme**	ONE TEMP	—	GUJ
2	Reader in Gujarati	ONE	—	GUJ/HIN
3.	Lecturer in Gujarati	ONE	—	GUJ
I.	**L.T. College of Nursing, Bombay-20**			
*1.	Staff Nurse	FIVE	ONE	—
J.	**P.V. Polytechnic, Bombay** (For Diploma Course in Electronics)			
*1.	Laboratory Asst-Cum-Storekeeper	TWO	ONE	ENG
2.	Lecturer in Electronics	ONE	—	ENG
	Dept. of Ophthalmic Technology			
3.	Instructor in Optometry	ONE	—	ENG
K	**Computer Centre of SNDT Women's University**			
1.	System Manager	ONE TEMP	—	ENG
L.	**Research Centre on Women's Studies** (Under Rural Development Programme)			
1.	Asst. Director (upto 31-3-1990)	ONE TEMP TENURE	—	—
M	**SNDT Women's University Library, Bombay-20** (Under Information Centre)			
1.	System Analyst (Up to March 31, 1990)	ONE TEMP TENURE	—	—
2.	Computer Data Entry Asst	ONE TEMP TENURE	—	—
3.	Research Assistant	ONE TEMP TENURE	—	—
N	**Dept. of Special Education, Bombay-49** (Under Extn Programme)			
1.	Co-Ordinator	ONE	—	ENG
O	**SNDT Women's University Bombay and its Institutions**			
1.	Jr Stenographer	ONE	—	—
*2	Clerk	THREE	ONE	—
*3	Peon	ONE	ONE	—
P	**SNDT College of Home Science, Poona**			
1.	Lecturer in Child Development	ONE PERM ONE TEMP	—	ENG MAR ENG MAR
2	Lecturer in Family Resource Management	ONE TEMP ONE HALF TIME TEMP	—	ENG MAR ENG MAR
3	Lecturer in Textiles & Clothing	ONE PERM ONE TEMP HALF TIME	— —	ENG/MAR ENG MAR
4	Lecturer in Foods & Nutrition	ONE TEMP	—	ENG/MAR
5.	Lecturer in Education & Extension	ONE TEMP HALF TIME	—	ENG/MAR

Minimum qualifications, salary scales, etc of the post of teachers are as per approved UGC scales and qualifications. Applications of Scheduled Castes/Tribes/Other Nomadic Tribes, will be considered as per Government directives

*Indicates post under reserved category and will be filled by SC/ST/ONT candidates only.

Dr. (Smt.) Usha Thakkar
REGISTRAR

Printed & Published by SUTINDER SINGH, on behalf of the Association of Indian Universities, AIU House, 16 Kotla Marg, New Delhi-110002. Grams : ASINDU. Phones : 3315105, 3313390, 3312305, 3310059 and 3312429 Telex 31 5578 AIU IN
Printed by Navchetan Press (P) Ltd. at Navjeevan Printers, 1-E/2, Jhandewalan Extension, New Delhi-110055. Tel. 529157